THE

ELECTRICAL REVIEW.

VOL. LXIV. MARCH 5, 1909. No. 1,632.

ELECTRICAL REVIEW.

Vol. LXIV.] CONTENTS: March 5, 1909. [No. 1,632.

	Page
Large Gas Engines	369
Contracts for Supply of Electricity, and Stamp Duty	370
Street Lighting	370
The Further Decision under the New Patents Act	371
The Report of the Tariff Commission on the Engineering Industries	372
Correspondence:—	
An Overcrowded Profession	373
Fibre as an Insulator	374
The Future of Electricity Supply	374
Dublin Electricity Supply	374
Polishing Commutators	375
Electricity in Mines	375
Why not a "London Section" of the I.E.E.?	376
The Consulting Engineer	376
Our Legal Query Column	377
Legal	377
Smoke Abatement: A Sheffield Exhibition	378
Business Notes	379
Notes	386
The Jhelum River Power Development (*illus.*)	389
City Notes	392
Stocks and Shares	400
Market Quotations	400
Share List of Electrical Companies	401
Metal Market.—Fluctuations in February	403
Supply by Meter, or Contract?	403
The Linseed Oil Fallacy	404
The Companies' Clauses Acts	405
Proceedings of Institutions:—	
The Kapp-Hopkinson Test on a Single Direct-Current Machine (*illus.*)	406
The Use of Large Gas Engines for Generating Electric Power (discussion)	407
New Electrical Devices, Fittings and Plant (*illus.*)	410
Foreign and Colonial Tariffs on Electrical Goods	412
New Patents Applied For, 1909	412

THE ELECTRICAL REVIEW.

Published every FRIDAY Price 4d.

The Oldest Weekly Electrical Paper. Established 1872.

TO BE OBTAINED BY ORDER FROM ANY NEWSAGENT IN TOWN OR COUNTRY.

OFFICE:—4, LUDGATE HILL, LONDON, E.C.

Telegraphic Address: "AGNEKAY, LONDON." Code, A B C.

Telephone Nos. Holborn 963 Central 4425 (Editorial only).

ALL Letters should be addressed to the Proprietors, H. Alabaster, Gatehouse & Co

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FOREIGN AGENTS.—New York: D. VAN NOSTRAND, 23, Murray Street. Toronto, Ont.: WM. DAWSON & SONS, LTD., Manning Chambers. Paris: BOYVEAU & CHEVILLET, 22, Rue de la Banque. Berlin: ASHER & Co., Unter den Linden.

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THE

UNIVERSAL ELECTRICAL DIRECTORY

(J. A. BERLY'S).

1909 EDITION

H. ALABASTER, GATEHOUSE & CO.,

4, Ludgate Hill, London, E.C.

LARGE GAS ENGINES.

THE paper read by Messrs. Andrews and Porter before the Institution of Electrical Engineers last month, and discussed at three centres, is certainly entitled to be called the paper of the session to date. It is true that the current session has not been remarkable for either the number or the quality of the papers submitted, but the paper referred to would have stood out in any session.

We publish elsewhere in this issue a report of the extended discussion accorded to the subject, in which it was dealt with from a variety of standpoints; it will be seen that while the authors underwent a fusillade of criticism, they had by no means the worst of the battle—their supporters about equalled their opponents in number and eminence, leaving out of the question the speakers who appeared to be divided in their own minds as to the relative merits of steam and gas plant.

There are certain broad features of the meetings which seem to us to be worthy of comment. The first is the change of attitude of British engineers during the past few years. Although they are still cautious, doubting and even incredulous, it is clear that their interest has been aroused, and that they recognise the big gas engine as one of the possibilities of the immediate future (the *fact* that hundreds of thousands of horse-power of such engines are at work abroad may be set aside for the moment). Several engineers whose position requires them to investigate such questions and to decide between the respective systems have obviously inquired closely into the matter, and have formed definite opinions which, though they may not at the moment be favourable to the gas engine, are swayed by so small a balance of advantage as to make it clear that the gas plant has substantiated its claims and is within the bounds of practice. A few years ago, while engineers were generally willing to admit that the gas engine would be the prime mover of the future, those who would admit its importance in the present were few indeed—and were severely criticised when they acted in accordance with their convictions.

The disastrous experience at Johannesburg, no doubt, lent support to these criticisms—on the surface; but in fact it only applied to a particular combination of circumstances—a certain type of engine, a certain type of producer, a certain kind of coal, and other conditions special to the case. Each of these items might, under other circumstances, have contributed to a successful result; but as it was, as everybody knows, the combination ended in failure. Against this can be set a number of important installations working with producers successfully; and while it is admitted (though not by all) that the producer is still the least satisfactory part of the plant, the fact that large gas engines work perfectly well with coke-oven gas, which contains a large percentage of hydrogen, shows that they, at any rate, may be depended upon.

It is certainly to be regretted that the owners of British iron works have not found it to their advantage to adopt blast-furnace gas engines on a large scale; had they done so, by this time British engineers would not present the curious spectacle of intelligent inquiry into matters of common knowledge (abroad) that they do. Doubtless the ironworkers have their own reasons for their inaction; their investments in gas-fired boilers and steam engines, which do their work quite well, together with the low cost of fuel in this country, and the frequent lack of visible demand for electric power in the neighbourhood of iron works, have weighed with them. There is always a tendency also for our fellow-countrymen to leave experimental work to other countries, and to take advantage of their pioneer work when the chief difficulties have been overcome; although it may be argued that this is only "getting our own back," for Britain first taught engineering to the world, we feel strongly that the practice is objectionable, and we would rather see our country leading the way again than following in the rear. The result has been that gas engines of over 1,500 H.P. are almost unobtainable of British make, and all the recognised designs are wholly of foreign origin. We may claim the producers—the "unsatisfactory" part of the plant—for this country, if we like!—and certainly the ammonia recovery system is British.

While the details of Messrs. Andrews and Porter's paper may be criticised, the authors have on the whole, we believe, held the balance fairly between the two systems. Our conclusion, based upon the paper and the discussion, is that under ordinary conditions there is little difference in running costs between the two systems. Whether the difference is in favour of steam or gas depends mainly upon the price of coal and the load factor. As to the question whether to install steam or gas plant, we reluctantly conclude that at present the advantages claimed for the latter, even if realised, are insufficient to turn the scale in its favour, except under special circumstances, such as the availability of blast-furnace or coke-oven gas, when the adoption of gas engines becomes obviously imperative. We hold, and have always held, that the future lies with the gas plant—but it has not yet merged into the present.

Contracts for Supply of Electricity, and Stamp Duty.

The case of County of Durham Power Co. *v.* Inland Revenue Commissioners, which was decided by Mr. Justice Channell on February 20th, raised a question of considerable importance to power companies. The question was whether a contract for the sale of electricity was subject to stamp duty. An agreement was presented on behalf of the power company (the appellants) for the opinion of the Commissioners as to the stamp duty with which it was chargeable. The instrument was an agreement between the appellants and a company (called the consumers) at Gateshead. By Clause 1 of the instrument, the appellants were to supply the consumers, and the consumers were to take during a term of seven years from the date of the instrument, all electrical energy used for motive power, heating and lighting requirements on the consumers' premises. By Clauses 3 and 4 the consumers were to pay for all electrical energy supplied thereunder a fixed charge of £57 10s. per quarter, and, in addition, 1d. per Board of Trade unit for all energy supplied and consumed as indicated by the appellants' meters, and 10s. a quarter as a rental for the meters. By Clause 5 the consumers were to be entitled to a supply of electrical energy up to the capacity of the existing installation, and Clauses 6 and 7 provided for increase of quarterly payments on increase of capacity of installation, and for reduction of quarterly payments on decrease of capacity of the existing installation, but so that in no case should the fixed charge of £57 10s. be reduced below £50 per quarter. The Commissioners were prepared to hold that the instrument was "an agreement or memorandum made for, or relating to, the sale of any goods, wares, or merchandise," within exemption (3) under the head in the schedule to the Stamp Act, 1891, "Agreement or any memorandum of an agreement," but also were of opinion as to Clauses 3 and 4 that it was an "instrument of any kind whatsoever, being the only or principal or primary security for sums of money at stated periods" for a definite period of seven years, so that duty was payable at the rate of 2s. 6d. per £100 of the aggregate amount of the minimum annual payments for seven years, and they accordingly assessed it. They so assessed it by reference to the heading "Bond, Covenant, &c." in schedule 1 of the Stamp Act, 1891. For the appellants the judgment of the Court delivered by Martin, B., in an old case was relied on "that the instrument should be stamped for its leading and principal object, and that this stamp covers everything accessory to this object;" that the instrument was really a contract for the sale of goods, and that that was its principal and primary object, and that, therefore, it came within the exemption (3) as being an agreement for the sale of goods. For the Crown it was contended that the agreement could not be distinguished from the agreement in National Telephone Co. *v.* Commissioners of Inland Revenue, where it was held by the House of Lords, affirming the decision of the Court of Appeal, that the instrument was chargeable with *ad valorem* duty. Mr. Justice Channell held that the case was really concluded by the decision in National Telephone Co. *v.* Commissioners of Inland Revenue (*ubi sup.*), and that the instrument was chargeable with the *ad valorem* duty, though the learned judge expressed his own opinion that such contracts for the sale of goods to be paid for in the future at definite times, and not by one sum, were not contemplated as coming within the provision.

It would seem from this that the learned judge is of opinion that the decision in the National Telephone case was wrong in principle.

Street Lighting.

Commenting on our article on street lighting in the City, the *Gas World* accepts the minimum of 0·1 candle-foot as a fair criterion for the lighting of important City thoroughfares, and concedes that there is not much to choose between the two systems. The freedom from obstruction of the footpath due to the bracket gas-lamps is claimed as an advantage for gas, while the suspension wires of the centre-hung arc lamps in Cannon Street are regarded as an obvious obstruction—especially to the Fire Brigade. Our contemporary is welcome to the utmost that can be made out of these weighty considerations, though we fear the Fire Brigade would display but a very languid interest in the matter. It is on the following remark that we find ourselves, as usual, at issue with our contemporary—namely, that "the gas lamps in Fleet Street are cheaper than the flame arc lamps in Cannon Street, the figures being £16 and £17 10s." The fact brought out in our article—that 11 of the arc lamps would more than suffice to give the same illumination as 16 of the gas lamps—is not revealed to the readers of the *Gas World*; allowing for this, the arc lamps are cheaper than the gas lamps in the ratio 3 : 4.

THE FURTHER DECISION UNDER THE NEW PATENTS ACT.

On the 18th ult. the Comptroller-General of Patents gave his decision (revoking the patent) in the matter of an application by George Braulik for the revocation of Letters Patent No. 23,606 of 1902, of which Mr. Paul Högner is the registered proprietor. There is a relationship between this patent and patent No. 18,786 of 1902, which was revoked, as shown by the summary of the decision which we gave in our issue of the 19th ult. The earlier decision related to the Bremer patent, the later to the Högner patent. In the case of the Bremer patent owned by the British Westinghouse Co., a licence was granted to a German company, Messrs. Körting & Mathiesen, and worked in the United Kingdom by their English representatives, the Union Electric Co. In the case of the Högner patent, the rights of which were transferred to the same German company, a licence to manufacture was given to the British Westinghouse Co. The patents are apparently for similar inventions, counsel for the patentees admitting that there is very little difference between them. The Comptroller-General says :—

> The main claim in the present (Högner) patent seems to me to be in substance anticipated by the Bremer patent, and, as a matter of fact, in the arrangements between the German Company and the Westinghouse Co., Högner's patent was apparently held of very small account. It appears from the parts of the licence, which have been disclosed to myself and the counsel for the applicant, referred to in my former decision, that no royalties are payable by the Westinghouse Co. in respect of lamps made under it, whereas on the other hand, substantial royalties are admitted to be paid by the German Company for lamps manufactured under the Bremer patent. No proceedings have been taken under it against infringers, and the patentees themselves in their first line of defence contend that the patent is not worked at all, although in the event of my holding that it is worked they maintain that it is mainly worked here and not abroad. In the circumstances it is at present a mystery to me why the applicant is so anxious to revoke it, and why the patentees are so desirous that it should not be revoked. It seems clear that in view of the prior Bremer patent it has not been hitherto considered by its owners as of any substantial value either by the Westinghouse Co. or the German Company, and that so far as it has been anticipated by the Bremer patent, it must be invalid.

A suggestion that the consideration of the two patents should be consolidated, was declined, because it was urged by the patentees' agents that the arguments were different in the two cases.

These arguments are summarised by the Comptroller-General in his decision. The full strength and relevancy of an argument may not always be conveyed when set forth in an abbreviated form to be subsequently demolished at greater length. If this difficulty is noted in perusing the full decision, our readers must be at a still greater disadvantage in reading a summary of the summary, but we will endeavour to give the substance of the arguments as closely as possible.

The first turns on the question : What is a patented article ? Counsel for the patentees claimed two meanings for the words "patented article," (1) an article manufactured in accordance with the invention ; and (2) an article for which protection is claimed by the patentees. Arising out of (2), the counsel urged that if a patentee deliberately resigns manufacture, and does not label the articles as patented, he is not claiming protection under the patent, and is, in fact, not using the patent. In this case no actions have been taken for infringements of the patent, and no royalties paid for manufacturing under it. Therefore, it is maintained that the patented article is not manufactured anywhere. The Comptroller-General does not agree with these arguments. In his opinion the question whether any article is patented or not must depend on the patent itself and its specification and claims and not on the use which the patentee may at any time choose to make of it.

The conclusion reached on this point gives rise to the next argument which covers very important ground, and which may be considered under the question : When has an article been manufactured mainly abroad or when to an adequate extent in this country ? Counsel for the patentees submitted that what has been done abroad and does not come into this country is immaterial—that importation was an essential in order that an article manufactured abroad in accordance with the invention might be brought within the meaning of Sec. 27. The Comptroller-General is against this argument also, and quotes the decision of the present Lord Chancellor in a case wherein an article delivered abroad and made abroad in accordance with an invention protected by a British patent is referred to as a "patented article." We should add that the transaction related to a sale and purchase effected in this country. On the question itself, the Comptroller-General says :—

> If the contention of the counsel for the patentee were correct, a process the subject of an English patent, if carried on exclusively abroad, would not be a patented process within the meaning of the section, and the section so far as processes are concerned would be meaningless. I have no doubt that the words "patented article or process" in the section mean an article manufactured or a process carried on, whether at home or abroad, in accordance with the invention protected by the British patent, and that if I were to accept the interpretation of these words suggested by the counsel for the patentees I should not only be doing violence to the plain sense and meaning of the section, but also aiding what appears to me to be an attempt to defeat the object of Parliament in passing the Act.

In commenting on the declarations and evidence, the Comptroller-General says that Mr. Eck, secretary of the Union Electric Co., agents for the patentees, declared that the applicant (Mr. Braulik) was not a manufacturer of arc lamps embodying the patent, but he imported such lamps without being licensed, and further, that, owing to the unlicensed manufacture and sale by the applicant and others, the licensees (the Westinghouse Co.) were prevented from fully developing the manufacture, and had on that account taken legal steps to restrain such unlicensed manufacture or sale.

> It seems, however, clear from the evidence that the Westinghouse Co. have not taken legal steps against the applicant, or so far as the evidence goes, against anyone else, with the object of restraining the unlicensed manufacture of the patented article. To this extent therefore the declaration is at variance with the facts.
>
> I must say that if the patentees intended in any way to justify their failure to make these lamps themselves in this country, by the manufacture here of lamps by the 13 firms in question, who they now suggest have made them, but against none of whom they have taken proceedings for infringement, or even according to the evidence of their own witness, Mr. Eck, written protesting against the alleged infringements, it was, in my opinion, very unfair of them not to give some notice beforehand to the applicant of their intentions in this respect, so that he might have had the opportunity of testing the truth of these allegations, either by applying to the firms in question, or otherwise. I quite agree with the counsel for the applicant, that if this precedent is to be followed in other cases it will be productive of great harm in the hearing of proceedings before the Comptroller, because in cases which have been kept short, possibly deliberately, as the counsel for the applicant contends has been done in this case, of material evidence in the proper way in which it should have been presented to me, namely, by declarations before the hearing, it will enable patentees to call in at the last moment to bolster up their case, evidence which neither the Comptroller nor the applicant has had any means of testing satisfactorily.

Evidence was given by Mr. Eck and by Col. Crompton as to the manufacture of lamps in this country which were claimed to be in accordance with the patent, though neither the patentees nor anyone on their behalf had written to a single firm protesting against the infringement of the Högner patent. The Comptroller-General deals at length with this evidence and the propriety or otherwise of admitting Col. Crompton's testimony, and sums up the position by saying :—

> I have considerable doubt whether I did right in allowing Col. Crompton's evidence to be given ; but I may say that even if I could assume that I was right, and that the estimates which he and Mr. Eck have formed of the manufacture in the United Kingdom of the lamps to which they have referred were correct, and that 60 per cent. of such of these lamps as were sold in the United Kingdom were manufactured in the United Kingdom, and the remainder imported ; this would not, in my view, go to show that the patented article was not manufactured mainly abroad, because it would leave altogether out of account the number of these lamps which are made abroad and not imported into this country, including those manufactured by the German company, who have been stated by Mr. Eck to be the premier firm of arc lamp manufacturers in the world, and one of the reasons which Mr. Eck gave to explain why that company did not make these lamps in this country, in his evidence in the former case, in which I decided to revoke the Bremer patent, was that they were supplying a far larger market than could possibly be supplied from this country.
>
> On the evidence before me I am satisfied that the patented article is manufactured mainly outside the United Kingdom.

It is the pronouncement made by the Comptroller-General as to the points to be considered in deciding the meaning of the words "mainly manufactured outside the United

Kingdom," that we think will be regarded as of the greatest importance, and it will doubtless be wished that the issue should be raised upon some case less complicated with subsidiary points than this Högner patent case affords. Patentees will probably desire to know whether consideration will be given to the extent of foreign consumption in all cases, or whether its introduction is dependent upon a claim such as is put forward in this case that unlicensed or infringing manufacture shall count in favour of a patentee when revocation is claimed. Considering that a somewhat large portion of the world is outside the United Kingdom and that some civilised countries exist there, it is conceivable that it might be difficult in the case of some inventions for a patentee to ensure that the United Kingdom shall maintain a consumption equal to a single-power standard, and it is probable he would certainly fail if an all-powers standard were required.

The Comptroller-General finds that the invention is not manufactured to an adequate extent, and that the patentees have not given satisfactory reasons why the patented article is not manufactured in this country.

> The number of lamps manufactured by the Westinghouse Co. is between 500 and 600 a year. It is alleged by Mr. Eck that a very much larger number are manufactured here by infringers; but even if I could accept as unquestionable his estimate and that of Col. Crompton on this point, it would be impossible for me to come to the conclusion that the patented article is manufactured to an adequate extent in this country, having regard to the very large number of lamps imported, some it is alleged by infringers, and some, it is admitted, by the patentees.

As to the satisfactory reasons, the Comptroller-General says—

> As a matter of fact, it would appear from the evidence that the patentees have not manufactured it at all here, and that their licensees make something under 600 lamps a year in this country. But their counsel contended that the giving by them of a licence to the Westinghouse Co. may be regarded as a manufacture by the patentees. It is out of the question that I should hold that a patentee may get rid of his responsibility for working a patent merely by granting a licence to work it to a firm who do not manufacture in the United Kingdom to an adequate extent, whilst he himself, in competition with his licensee, is importing far larger quantities than the licensee makes in this country. I do not see that there is any good reason which would prevent the patented article from being made in this country to an adequate extent by the patentees. Their witnesses allege that it has been manufactured for years past in increasing quantities in this country by infringers, who, it is to be presumed, would not so manufacture it if they did not make a profit by doing so. In these circumstances I fail to understand why the German company could not have manufactured it at a profit here.

It will thus be seen that there are a great many side issues and somewhat complicated questions in this latest case, and, as already remarked in substance, we should like to see the pronouncements of the Comptroller-General on some case wherein the same main questions could be considered on more definite evidence and less involved arguments than were apparently available in this case.

THE REPORT OF THE TARIFF COMMISSION ON THE ENGINEERING INDUSTRIES.

We should be not far from the truth in describing the self-appointed Tariff Reform Commission as judge, jury and prosecuting counsel combined. That its mind was made up, and its verdict agreed upon before hearing the evidence, is clear from a perusal of the reports of the evidence given, and the recommendations made.

When we call to mind the "raging tearing propaganda" which preceded the Commission, and remember the tariffs then proposed, it becomes more than ever obvious that the evidence given by the various witnesses either for or against tariff reform has carried no weight at all with this packed jury, and, so far as the recommendations are concerned, it has been a mere waste of time. It is interesting, however, for the light it throws on the ideas and aims of the protectionists.

If, for example, we turn to the Report on the Agricultural Industries, we find that one farmer after another claims that a duty of 5s. to 10s. a qr. should be put on wheat. The Commissioners, in their report, point out that, according to the evidence, no considerable extension of wheat growing can take place unless duties are imposed "which would be as high, and in most cases higher, than those which prevail in the most highly protected foreign countries." But what do they recommend? Mr. Chamberlain had spoken of a 2s. duty on wheat, and a 2s. duty is therefore recommended, not 10s. which the evidence appears to justify.

If we turn to the textile report the same farce is repeated. Witnesses demanded duties ranging from 10 to 25 per cent. on cotton yarns, webbing, curtains and kindred articles, and as much as 50 per cent. on silk. "The upper classes can well afford to pay" say some of the witnesses (forgetting the well worn shibboleth "the foreigner pays the tax"). Yet the Commission recommend that raw cotton, cotton yarns, and twists of all descriptions shall come in *free*, and that duties *not exceeding* 10 *per cent.* be placed on manufactured goods. A duty of 10 per cent. is also recommended on imported pottery, for the same reason—viz., that it is in accordance with the preconceived policy of Mr. Chamberlain, notwithstanding the fact that a large majority of the manufacturers say that a 25 per cent. duty is necessary in order to make their business profitable.

True, there were witnesses whose evidence is summarised in the report, who opposed any tinkering with protection; but the weight of evidence was overwhelmingly in favour of protective duties. But what value is one to place on evidence which, if accepted, would tend to prove that Lancashire was solidly in favour of protection. The fact is that the bulk of the evidence is, as one naturally expected, biased; and the "Commissioners" knew it, and discounted it accordingly.

After all that has been said and written about our decadent engineering industries and the urgent need of protection if we are to hold out any hope of retaining the little that is left to us, we turn to the report last issued fully expecting to see a comprehensive list of proposed duties on various manufactured articles. But, what do we find? Nothing; not a single recommendation! The mountain's labour has not brought forth even the proverbial mouse. Extraordinary as this at first sight appears, the reason soon becomes obvious on reading the report.

Whilst many influential witnesses express the opinion that a small dose of protection would tend to improve trade, these witnesses did not bring forward any convincing argument in the shape of solid facts to fortify their opinions. There is little doubt that had there been any shadow of support for such opinions the "Commissioners" would not have remained silent. One can understand, and to some extent sympathise with, the individual manufacturer who sees in a protective tariff the rout of a foreign competitor; but the difficulty appears to be to protect one manufacturer without, in some way, injuring another, to say nothing at all about the consumers' point of view.

Thus, to take an example or two from the evidence of witnesses engaged in different trades, we find some clamouring for duties ranging from 25 to 50 per cent. on earthenware and china; others asking for duties ranging from 25 to 40 per cent. on manufactured iron; others, for duties on imported timber, and so on. On the other hand, builders and brickmakers protest that any such duties would injure their business. For instance, W. T. Chapman says, "Your proposed policy can only do injury to the brick and building trades, however it may enrich the millers and machinery manufacturers."

Again, Grover & Sons, builders, say, "We do not want tariff charged upon rolled-iron and wood, the only foreign goods we use."

John Hull & Sons say, "The imposition of any protective tax would increase the cost of our production without enabling us to obtain a better price for our goods, and would have a disastrous effect in our trade on both employer and employed."

The above are samples of the replies from manufacturing or building firms whose business depends upon free imports.

It is openly admitted by some witnesses that an import duty which would benefit them would injure others, and some very naive suggestions were made with a view to getting round the difficulty. The following is a delightfully cool proposal. Messrs. John Alexander & Sons, earthenware manufacturers, say: "Agriculture is not paying, and we know of a great many cases where neither landlord nor tenant can afford to spend money on draining. The only remedy we can suggest is to give the farmers a bounty of 10s. to 15s. a quarter for the wheat they may have in the stack-yard in February."

With such a bounty as this, farmers would naturally have all their wheat stacked until February, and the taxpayers of this country would have to pay something like £4,000,000 to the farmers to enable them to buy protected drain pipes! It is fortunate that England is a rich country, for drain pipes are a mere bagatelle compared with some of the other industries which ask for Protection.

Another point which attracts the attention of the reader of these Tariff Reform reports is that manufacturers make no secret at all of the fact that a protective tariff will increase the cost of the protected article. Hitherto one of the most persistent parrot cries has been—"The foreigner will pay the tax." But will he? Let us quote again from the evidence of witnesses. Mr. Mitchell, wool manufacturer, says:—"A duty of 10 to 20 per cent. [the higher duty being on the higher-priced goods] would enable us to raise revenue from those best able to pay it." Again, he tells us that in getting a higher price for his goods the manufacturer would get it from people "who could well afford to pay more."

The Conway Woollen Co. say that the effect of duties would be "to improve the price." Messrs. Porrit Bros. and Austin, in suggesting 15 to 25 per cent. duties on cotton and woollen goods, say that prices would "probably advance at first almost to the extent of the duty."

Messrs. H. Goodwin, Ltd., who suggest a 20 per cent. duty on Dutch glazed tiles, &c., say:—"The effect would be we could advance prices quite 20 per cent."

Messrs. G. L. Ashworth Bros. suggest duties on pottery ranging from 10 to 50 per cent., and add, "prices in most cases would be raised and would be firmer." Of course they would. "The foreigner pays the tax." Indeed!

Before summarising or commenting on the evidence given in the engineering section, there are some points of interest worth noting in the body of the report itself.

The matter is fairly summed up in the following paragraph:—"The general tenour of the evidence is that, despite labour and other difficulties, the engineering industry on the whole has progressed during recent years, but not so rapidly as the demand has increased for engineering products, or as rapidly as the engineering industries of other countries, particularly the United States and Germany."

It is pointed out that the engineering and shipbuilding industries have suffered through labour difficulties, yet, notwithstanding these difficulties, the Report tells us that "in the shipbuilding industry the output of merchant tonnage has increased by 50 per cent. in the last 10 years." About one-third of the shipbuilding is on foreign and colonial account, and "the increase of shipbuilding is largely due to the requirements of the coal export trade." Yet several witnesses were favourable to an export duty on coal. Obviously a restriction of our coal exports would be a bad thing for the shipping industry, and it is common knowledge, or ought to be, that the cost of labour forms a preponderating proportion of the selling price of the coal itself, and that we have sufficient coal *visible* to last for over 400 years at the present rate of output.

This 50 per cent. increase in shipping during 10 years forms a somewhat curious comment on the pictures published a few weeks ago by the Protectionist Press, showing a large number of ships lying up in the Tyne, proving, so it was claimed, that the shipping industry was dying. There was never a time within our memory where there was not a large number of ships lying up in the Tyne. Many of them will never go to sea any more; they are on the marine scrap heap. One might just as sensibly point to an engineering scrap heap and claim that it proved the decadence of engineering. It, of course, proves just the opposite.

(*To be concluded.*)

CORRESPONDENCE.

Letters received by us after 5 P.M. on Tuesday cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

An Overcrowded Profession.

I have read with interest "Ohm Sick's" letter in your issue of February 19th, 1909, and am sure he points out a growing evil in the profession. As a man with experience of both corporations and companies, I should like to offer some advice to young engineers who may be tempted to apply for the junior assistant engineers' berths, which we see advertised, on the large supply companies. They offer, as a rule, what they are pleased to call a nominal salary, which works out at an average of 15s. a week for the term of years spent with them. Their great war cry is the splendid experience they can offer you, which is all very well, but one can't live on experience; also, that your way in the profession will be made directly you can say you have served a term of years with them. Bunkum! To any man who is already in the profession I would strongly advise him to shun company advertisements, and to remain where he is, greatly tempted though he may be to get on to big work. In the first place, they require you to sign an agreement, usually for two years, sometimes three, so that for that length of time, no matter what appointment may be going, you are out of the swim and cannot apply for it. If you should happen to leave, your agreement is kindly cancelled, for the company will not take action against you, as they hate publicity of their methods, but they refuse to give you any testimonial or reference for the time you have been with them. This, in itself, deters a man from leaving during his term of agreement. When your agreement is finished you are handed a printed testimonial and your notice, your place being filled by a new misguided and unfortunate man who has signed on. Whether you have been a good servant to the company or a bad one, the testimonial is the same, being handed out from stock, so that there is little encouragement for a man to do his best. One meets juniors who are incompetent to take charge of a shift themselves, and who are consequently put to assist other juniors, who are capable of taking charge, but at the end of the agreement, each man has the same testimonial. Of course, if the company suffer from a dearth of men, and are unable to obtain new juniors, the men whose agreements are completed are usually kept on at a small increase; but as soon as their places can be filled, they go. Intending applicants would do well to study the fact that during their agreement, no matter how their eyes are opened, they are barred from applying for jobs, and afterwards if sacked at once, they are under the great disadvantage of finding a job when out of work, no small order, for gaps in one's experience always look suspicious in an advertiser's eyes, even though the fault may not be the applicant's; also if kept on it is only for a short period, and they have the worry of finding a new berth in a few weeks. Congenial berths are not found in a moment. Besides this, there is the fact that theirs is not the only application for that company; probably several other juniors have also applied, with the natural result that the advertiser finding so many from one firm, suspects fishiness, and relegates the whole of them to the waste paper basket. A bitter blow to the fond delusion that a term of years on the company would be the making of him—he finds rather it is the marring of him. What the companies desire are dividends, and cheap labour is a great factor in the attainment of this object, so that their side of the question is obvious, and so long as they can get men to sign their agreements, so long will the present evil continue. Directly the young engineers see that they are not only damaging their own prospects, but also the profession generally, they will cease to apply for such *remunerative* berths. The man in the street is fond of criticising the city electrical engineer, for no city official is above criticism to him, and he remarks that he has to pay more for his units than he would if he got them from such and such a company. He thinks his city engineer cannot be as good an engineer as the company's, or things would be different. What he forgets is the fact that the city engineer pays better wages, even if his

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are low, than does the company. Let the man in the street desire not cheap units at the expense of the flesh and blood of the staff. The market price of an article depends upon the cost of manufacture, but too many manufacturers sell as cheaply as they can, and after deducting dividends and expenses, what is left is divided amongst the staff as wages. Let the price rather be determined by paying reasonable wages as a basis; add on expenses and a fair dividend, and thus decide the price of the article. For the companies' dividends and cheap supply are derived not from more efficient engineering, but from sweating and low wages. The junior assistant engineers on their staff, who at no time get an existing, I will not say living, wage contribute in no small way to it. To be on the company as a junior at all, one must have private means, and it is the amount above his wage that it costs him to live that the company gain to help their dividends. It would be of little use appealing to the companies for more honest conditions, as they are merely dividend hunters, so that the only way of checking the evil is to enlighten the intending applicants and to remind them of the old proverb "Look before you leap." The companies will improve wages fast enough when they find they can no longer obtain men who are willing to work for such a monstrously unfair remuneration.

Adsum.

Fibre as an Insulator.

Referring to "Puzzled's" letters in your issues of the 5th and 19th inst., vulcanised fibre can hardly be considered a first-class insulator. It certainly is not suitable for the purpose that it has here been used for; in fact, unless the situation is perfectly dry it is not good enough even for telephone work. I have taken out a number of test boxes in subways, the insulating material of which was vulcanised fibre, and replaced it by porcelain insulators, as I found we could not get satisfactory results, fibre being too hygroscopic.

The atmosphere of the subways, no doubt, was moist, although warm; undoubtedly the fibre became damp, and a path of low resistance was formed between the two conductors with the resultant arcing and fusing of metal.

I will ask "Puzzled" not to consider me uncomplimentary; in the first place, however, providing everything else was correct, why was not the neutral placed in the centre of the box? By that he would only have had 200 volts between conductors, although 400 between outers; again, is it not against ordinary practice to insert a fuse in the neutral? Judging by "Puzzled's" sketch of fuse-box, I should say this type of box is badly designed, and very dangerous, and I would, in my humble way, strongly advise "Puzzled" to do away with these boxes, and substitute some other safer type of box, many of which are on the market, before something more serious happens.

I cannot lay claim to having had as many years' experience as "Puzzled," but unless I have misunderstood his letters, the whole arrangement appears to be shoddy, and against all modern ideas of safety, and one that does not conform with I.E.E. or Fire Office Rules.

A. W. Wyatt.

Cornwall County Asylum, Bodmin.
February 23rd, 1909.

The Future of Electricity Supply.

Considering the rate at which carbon-filament are being replaced by metal-filament lamps, with the consequent reduction in revenue, it seems extraordinary how little is being done by the supply companies in pushing other household electrical appliances to make up the deficiency.

When the incandescent mantle came on the market, the gas companies did not waste time in pointing out its defects to consumers. They at once set about getting more consumers, pointing out that the saving in lighting would partly pay for their cooking, with the result that they have successfully kept electricity at bay up to now.

I do not suppose there is a single district supplied with electricity where there are not, at least, a hundred gas ovens to every electric oven in use.

Why is this so? Is it because electrical manufacturers cannot *yet* produce an oven which will compete with the gas oven, or is it because the supply companies do not encourage the manufacturers?

It seems to me that it would be a good plan for those responsible for the production of revenue to give more time to the development of this department, and less time to cursing auto-transformers and metal-filament lamps.

Pro Electric.

February 28th, 1909.

Dublin Electricity Supply.

Your criticisms of the working of the Dublin electricity department appear to have been written without a full knowledge of the contents of the reports of the City Treasurer and of the Lighting Committee, which will be brought for the first time before the Municipal Council at its meeting to-day.

So far from these reports evidencing or even suggesting a *débâcle*, they clearly show that instead of the "business wilting and dying" as you suggest, it is, on the contrary, making very satisfactory progress in spite of the many exceptional difficulties it has had to pass through, and in spite of its being saddled with the sum of £58,000 capital expenditure upon the old Fleet Street installation of 1892.

The capital expenditure upon the present system commenced in 1901, but the generating station did not commence supply operations until the autumn of 1903, when the number of consumers supplied was 350. The consumers at the present date number 2,100, and are rapidly increasing, and the annual output for private consumers has increased during that period from 857,000 units to 2,720,000 units. The average price for private supply during the same period has been reduced from 4·3d. to 3·2d., this latter price comparing very favourably with the higher prices realised by the London stations having a much larger load factor. For instance, West Bromwich, 4·2d.; Chelsea, 3·45d.; Kensington, 3·25d.; Westminster, 3·52d.; Hampstead, 3·24d.; Marylebone, 4·2d. With these results, Dublin can scarcely be termed a "dying" undertaking.

Your statement that upon five years' working there has been a positive loss of £52,000 does not accurately represent the facts. Nearly half of this amount is represented by charges against the old Fleet Street station, and for capital charges on the new undertaking during construction. Since the station commenced working, the loss during the last five years amounts to £28,000, but this includes a sum for capital charges on the old Fleet Street installation amounting to approximately £16,000, leaving the actual loss at £12,000 on the past five years' working. Of this amount a sum of over £3,000 is accounted for by an unexpected increase in the price paid for coal of 4s. per ton during the year ending March, 1908, and of the balance over £2,000 is due to the lessened revenue obtained from consumers by the introduction of the metallic-filament lamp.

As I have pointed out above, the charges to consumers have been reduced year by year; the last revision of rates of charge was put into force before the advent of the metallic-filament lamp, and, being based upon the average consumption of the carbon-filament lamp, naturally enabled consumers who adopted the former lamp to effect savings in their annual bills varying from 40 per cent. to 60 per cent. Needless to say, the rates to consumers would not have been cut down to such a low figure had we been able to forecast the effect of the introduction of the metallic-filament lamp, and in view of the large saving to Dublin consumers, I cannot see any injustice in the suggested temporary increase of rates, for private lighting only, by 10 per cent.

Your suggestion that the amount set aside for depreciation is only £1,300 is quite beside the mark, as it takes no account of the sum of £91,700, being the amount of loans repaid up to March, 1908.

I am astonished at your reference to the public arc lighting in Dublin. So far from being a discredit, it has been acknowledged by all engineers who have seen it to be one of the most effective and up-to-date installations in the Three Kingdoms. I think before you make such a random assertion you should ascertain the actual facts.

Your remarks upon municipal trading and your laudations of the local tramway and gas companies I pass by, as they are purely matters of opinion. I would only remind you of the self-evident fact that if the Corporation generating station had the advantage of the annual output of 10 million units required by the tramway company, it could generate quite as cheaply as the latter.

M. Ruddle,
City Electrical Engineer.

Dublin, *March 1st*, 1909.

Polishing Commutators.

I should be glad if some of your readers would kindly enlighten me as to whether it is at all beneficial to polish commutators with metal polish.

I happen to know of a case where some half-dozen D.C. machines aggregating 2,000 KW. are polished after every run with "Shinio" metal polish. Would this not be detrimental to the machines, as well as a waste of time?

Conocimiento.

Electricity in Mines.

I note the remarks made by "Colliery Electrician" in the current issue of the ELECTRICAL REVIEW, on my former letter, bearing only upon the danger of explosions by firing gas through using electricity. If I have overlooked anything, I am sorry, and I will try and remedy any deficiency in this letter. Now, in the first place, is not the danger from explosions caused by electricity the greatest danger? Any fatalities through this cause generally mean a serious loss of life. Fortunately, accidents from this cause are not numerous; they are far too serious to be an every-day occurrence.

But the reason of this is owing, in many cases, to the ventilation of the mine being good. I myself would rely more upon the ventilation of the mine being good, than upon any gas-tight electrical machinery that was ever built. In many mines there are accidents happening daily to cables, switch and fuse boxes, &c., causing sparking and flashing, which are due solely to unexpected falls of roof, and the rough conditions of the mine which cannot always be avoided; I need not say that no mention is made of these. But should there be any gas about through any defect in the ventilation, and an explosion s caused, then there is another tale to tell.

With reference to fatalities from shock, &c., this is very easy to guard against. I am sorry that there should be so many accidents of this description. But, I say, use more and better insulation, good earth connections, and efficient inspection, competent men, &c., to attend to and run all underground electrical machinery, and accidents from this cause will be few and far between. All men ought to be competent for the work they are set to do. As I have said before, it does not matter how clever the electrician may be, he cannot guard against accidents due to the ignorance of persons employed in running electrical machinery.

With reference to the colliery manager not knowing as to the capabilities of his electrician, let me tell "Colliery Electrician" that managers of to-day are not the managers of years ago, and it does not always follow that a manager must be a competent electrician to find out if his electrician understands his work or not; if a manager places coal-cutting machines and other electrical machinery in the hands of ignorant persons to attend to and run them, his electrician will soon find some repairs to do to test his abilities without waiting a year. A manager does not always judge the capabilities of a man by the amount of repairs he does, but by the amount of machinery he can look after without any repairs being needed.

With reference to wiremen being employed, I know some good men of this description who are in charge of large power plants, and who keep the same in good condition, and I, myself, with my 20 years' experience in a good many branches of the electrical trade, would sooner trust any of my electrical plant to the care of an electrical wireman whose duties generally are putting in electrical installations of all descriptions, than I would trust a man whose only recommendation was shop experience; it is not the man who makes the instrument that gets the money, but the man that can play the tunes. I have seen many of those so-called electricians, with shop experience, that could wind an armature or field coil with anybody, but as to the actual installation and use of electricity, they knew nothing whatever about it.

I may say that in some large electrical works that I have visited, I have seen some very skilful young lady armature and field coil winders. They are not requiring colliery electrical jobs at present, but one never knows what may happen.

Now, I don't see the reason of this craze for certificates of competency; actions speak louder than words. I myself am quite satisfied to let the manager take the responsibility, and do my work to suit him. He is paid for the responsibility, I am not, and it does seem peculiar to me that colliery electricians require it put down in writing that they are competent, when colliery mechanical engineers who draw three and four times as much in wages per week in many cases as the average colliery electrician are quite content to let things remain as they are, and abide by instructions from the manager. "Colliery Electrician" must bear in mind that a certificate of competency will not prevent a man from putting in time and doing as little as possible, especially if he is paid by the shift. I know very well that some electricians are not all they should be, but that is the manager's look-out, not ours. We have plenty to do to attend to our own plants and work without troubling about what any other people do; their troubles will not fall upon us.

Some colliery electricians I know have such a high opinion of themselves that they would, no doubt, like to reverse the order of things, and employ the manager. I am very pleased to say this is not so in my case; I have put down electrical machinery for all descriptions of mine work for my manager, and I am quite content to abide by his decision in all things respecting mine work. He is the responsible person, and it is quite proper that he should be so; he knows more about his mine than I do, and he knows where it is safe to use electricity.

But I still say, if there is any danger from explosions through the use of electricity, do not use it. Take electricity as far as you can, and everywhere you can. But safety must be the first consideration. It is not possible to put motors, switchboxes, and other electrical material in a mine, through an efficient every-day test, similar to that gone through by a safety lamp before leaving the surface. When electricity has been taken as far as is consistent with the safety of the mine and miners, then use electrically-driven air compressors, which, I may add, can be used with great efficiency, and a much better factor of safety where there should be any liability of gas.

In conclusion, I may say that this will do more to help the use of electricity in mines than any other thing, and make it less of a bogey than it appears at present to be to many, and if you value a good thing, take care of it, prevention is better than cure, any day.

Mines Electrical Engineer.

I consider that "Colliery Electrician" has touched on some very important points in his letter. He asks "Mines Electrical Engineer" if he could credit a plant being in charge of a so-called competent electrician who could not even insulate a joint properly. I know a head colliery electrician with three or four pits under his charge who only a few months ago could not make a T-joint on a 19/18 cable or connect up a D.C. motor (shunt), but had to be shown by the foreman, yet to hear him talk he knew it all; needless to say, when work got slack, he was one of the first to go. Yet that man could produce plenty of testimonials; but if they are examined carefully for a few minutes, we find he has been continually on the move, and content to work 25 per cent. below price. Why?

A colliery electrician has, to a certain extent, the lives of others in his hands; therefore, too great care cannot be taken in the selection of men for these positions, and if managers gave preference to an applicant who, in addition to having had the practical training and producing proofs of having held his various situations for reasonable periods of time, could also produce theoretical certificates, they would know that they had a man who had his mind concentrated on

his work, not one who when difficulties arose had to hang the job on until his mate turned up and assisted him.

A few months back the Electrical Contractors' Association commenced a registration scheme by which they take up an applicant's references, a minimum of three, with the result that to-day they have a large number of reliable workmen who will not disgrace their employers, and at the same time keep the undesirables in the background, and if the above suggestions were carried out, I believe it would do the same for the colliery managers.

Another Electrician.

Why Not a "London Section" of the I.E.E.?

Judging from your own comments and from the tone of the letters which have recently appeared in your columns on "The Need of Co-operation in the Electrical Industry," there appears to be but little faith that the newly-formed Electrical League will bring about the desired end.

For some considerable time I have had an idea in my mind which I wished to ventilate, but held back in the hope that some more influential person might bring it forward. I believe I was one of the first to suggest the formation of Local Sections of the Institution of Electrical Engineers, and I would now go a step further and suggest that a London Local Section might with advantage be formed.

At first sight this would seem to be quite an unnecessary departure, but the idea is one which I think has much to recommend it, and the more one thinks of it the more there appears to be in it.

The provincial sections have their own committees, who are probably in closer touch with the local activities of the industry than is the headquarters' Council with the industry generally. It is, I think, admitted that the most practical papers are read before the local sections, and latterly headquarters have had to draw upon the local sections for papers. London members appear to prefer reading papers which deal with practical or commercial considerations before a local section, rather than before a London meeting of the Institution.

There must be a reason for this. I think it will be admitted that the discussions at the local sections are generally freer, more informal, and more directly practical than those which take place at the meetings in Great George Street. This is not because the London members are not practical. On the contrary, they are continually recruited from the most practical men from the provinces; but a member who will take part regularly in the discussions at a local section may be just as regularly dumb at a London meeting. The meetings may be too big, there may be an air of formality or stiffness about them, or the papers may be too academic or too general in their application—whatever it is, there is a difference.

Now, if London members had their own local section, at which papers of a practical or "bread and butter" kind were discussed, I feel sure that the discussions would at least equal in enthusiasm and directness those of the local sections. The London section might have its own Committee, and its own chairman if desired, or a chairman might be elected at each meeting. The latter would tend, perhaps, to less formality, and would have other advantages which I need not enumerate. The headquarters' meetings would still go on, but the papers would be those dealing with general principles or matters of a scientific rather than of a commercially practical character.

There is no reason why at meetings of the local sections, including, of course, the proposed London section, matters affecting the general welfare of the industry, including even "Co-operation" and "Tariff Reform" if need be, should not be discussed, and resolutions passed which could be in the nature of recommendations to the parent body. There should be an interchange of ideas between the various local sections on matters of this nature, and their joint opinion on any matter would then be an expression of opinion of the whole of the industry, an opinion which the general Council would be bound to recognise as such. I feel sure that there are many things which a London local section might do which are a little outside the activities of the parent body. Seeing that shortly we shall have our own Institute, there should be very little difficulty in arranging for sectional meetings, and the more we use the building the more we shall justify its purchase.

I fear I have put the matter in a very crude and disjointed way, but I am confident that a London Local Section of the Institution could discuss with profit many of the vital questions which are from time to time raised in the technical Press, but which get no further.

Frank Broadbent.

London, E.C., *March 2nd*, 1909.

The Consulting Engineer.

I read with interest your suggestive article in last week's Electrical Review. Any attempt to find a remedy for this evil of incompetence amongst consulting engineers is to be commended.

That the evil is great, no one with any knowledge of the state of affairs will deny; that it is peculiar to the electrical trade seems evident to one who has had ample opportunity (as I have) of comparing the consulting electrical engineer with the consulting civil engineer. Of course there are splendid exceptions amongst electrical consultants; there are men amongst them who are equal in education, experience and ability to any to be found in the sister profession, but there is a big percentage of "wasters"—ill-trained, inexperienced and fundamentally incompetent men, including some who run a consulting business as a contributory side line.

Turning to your suggestion that the remedy may lie in the payment of consulting engineers upon results, I would draw attention to a root evil, without the removal of which such a practice would inevitably tend to increase the disabilities under which the contractor is placed by the incompetent consultant: that is, the freedom of the latter to insert in his specification a clause which shifts the whole responsibility for the success of his scheme on to the shoulders of the contractor. This clause usually begins by throwing out the suggestion that the more or less elaborate drawings issued with the specification may be incorrect, and goes on to insist upon the supply by the contractor of everything that may be necessary to the satisfactory operation of the plant, whether mentioned in the specification or not. It is, in fact, a veritable certificate of the consultant's own incompetence; but it is allowed to stand by consent of the purchaser, who, very properly, places himself unreservedly in the consulting engineer's hands, and of the contractor, who knows that if he take exception to it, he must lose the order. Once accepted, there is seldom any escape from it; for the incompetent is usually astute enough to make himself sole arbiter in the event of dispute between contractor and purchaser.

You write of "the growing tendency of large firms to keep on their staffs men who are undoubtedly specialists." I consider that such specialists are an absolute necessity, their business being principally to supervise the consulting engineer, both at the time of tendering, and when the contract is in hand. Is it cause for wonder, therefore, that a contractor prefers to let his specialist work without any consultant? In the one case, the specialist's skill is often devoted to making the best of a bad job; in the other, to the conception and carrying out of a good one. Unfortunately, there must be, in either case, enormous waste of brains and money; for, if a dozen firms tender, each employing its specialist, the preliminary work in connection with the job in hand is performed 12 times over.

Unless the consulting engineer can be forbidden to shirk his responsibility, I am afraid the scheme you suggest would simply mean that the consulting engineer would pocket the bonuses, and the contractor suffer the penalties, the latter being even heavier than at present.

Penalty.

March 1st, 1909.

Northampton Electric Lighting.—The local electric supply company is proposing to increase its generating plant by the addition of a 1,000-H.P. unit.

OUR LEGAL QUERY COLUMN.

[Questions addressed to this column should be written on one side of the paper only.]

"Compensation" writes:—"A manufacturer of a certain material requires in the process of manufacture that it should continue without a stoppage for six hours at a time. If for any reason a stoppage is caused, even momentarily, the process requires to be continued for at least an hour longer to get the same effect. If the stoppage lasts ten minutes the material is wasted, and the loss to the firm will be at least £250, without any allowance for removing the wasted material, or loss in wages due to the material not being ready at the proper time.

"If the manufacturer installs a motor for doing the work, and takes a supply of power from a municipal authority supplying electricity under a provisional order, has he any claim for compensation, under common law or otherwise, if the supply fails, and it can be shown that the failure was due to—

"(*a*) A mistake on the part of a switchboard attendant at the supply station.

"(*b*) A mains workman disconnecting a wrong cable by mistake.

"(*c*) A mains workman causing a short circuit by accident or carelessness.

"(*d*) Any other reason which may be held to be default on the part of the supply authority, not being wilful default?

"There is nothing in the provisional order bearing on the matter."

*** Unless electricity is furnished upon the terms of a special agreement, it seems that the only remedy of the consumer whose supply is stopped as above mentioned, is to sue for penalties under the Electric Lighting (Clauses) Act, 1899. Sec. 30 of the schedule to that Act provides that where undertakers make default in supplying energy to any owner or occupier of premises to whom they may be, and are required to, supply energy under their provisional order, they shall be liable in respect of each default to a penalty not exceeding 40s. for each day on which the default occurs. This is subject to the proviso that the penalties to be inflicted must in no case exceed in the aggregate in respect of any defaults, not being wilful defaults on the part of the undertakers, the sum of £50 for any one day. It is also provided that in no case shall any penalty be inflicted in respect of any default, if the Court are of opinion that the default was caused by inevitable accident or *force majeure*, or was of so slight or unimportant a character as not materially to affect the value of the supply. It would seem from this that "Compensation" would have some difficulty in extracting his total loss from the supply company if there was a temporary stoppage. If it is the fact, however, that the supply is here granted under a special agreement, the penalty clause will not apply, and damages might be claimed for breach of contract (see Morris *v.* Loughborough Corporation, 1908, 1 K.B., 205). The laws of England and Scotland are the same for this purpose.

LEGAL.

Clarke *v.* Borough of West Ham.

The action of Clarke *v.* The Mayor, Aldermen and Burgesses of West Ham, which was opened on Monday last before Mr. Justice Coleridge and a Common Jury in the King's Bench Division, raised an important question as to the Corporation's liability in respect of an accident happening on one of their electric tramcars caused by the electric current.

Mr. J. A. Simon, K.C., M.P., with Mr. Elken and Mr. Forest Fulton appeared for the plaintiff, and the defendant Corporation was represented by Mr. Danckwerts, K.C., and Mr. Morton.

Mr. Doughty having stated the nature of the claim, Mr. Simon said the plaintiff was suing in respect of alleged negligence in the management of an electric tramcar, and the defence would be that the damages for which the defendants were liable were limited to £25. He thought that the matters alleged by the plaintiff would substantially not lie in dispute. The West Ham Corporation were the tramway authority for West Ham, and the plaintiff having been injured on one of their tramcars, he thought it would be admitted that they were answerable for the damage the plaintiff had suffered. While getting on the outside of one of the West Ham Corporation's cars he sustained a very severe electric shock. The tramway was worked on the overhead system. On July 20th, 1907, the day when the accident happened, the plaintiff, who was a motorman in the employ of the defendant Corporation, finished his work, and having changed his clothes, went down to Canning Town on business of his own. He was returning about 8 o'clock in the evening, and when in the Barking Road he boarded a tramcar on which the accident occurred. Up to that time he was a strong man with nothing the matter with him, and he had served in His Majesty's army. He mounted the steps to get on the outside of the car and was making his way to one of the single seats near the standard when the car gave a jerk, and he put out his left hand to steady himself. His hand came in contact with the standard, and he found himself glued to it owing to the current passing through him. He was left in that position for a considerable number of yards until the car, passing over a place where the current was interrupted, the current was cut off and he was released. Counsel did not think that it would be disputed that the damage the man had suffered was very considerable, indeed. He had not since been able to work, and was no longer in defendants' service, in fact, Scotland Yard would not give him a certificate to drive a tramcar. He did not think that it would be suggested that he had recovered, and the probability was that he never would completely recover. The actual loss in money he had suffered was considerable, but was small to what he had suffered and would suffer in other ways. Counsel contended that if people allowed electrical current to escape they were liable. There was authority for that contention in America, and he thought also in this country. If people let loose a thing that was as dangerous as electricity, it followed that they were liable for the consequences. Apart from that, the West Ham Corporation when they got the Board of Trade's permission to use electricity instead of horses, had to comply with conditions which made what had happened a breach of the statutory duty. When there had been a breach of their statutory duty they were not at liberty to rely on some suggested £25 limit of liability. Their contention was that according to their by-laws the plaintiff became a passenger travelling on the roof upon certain terms — amongst others that the maximum amount recoverable from the defendants on account of any injury or damage was £25. The defendants relied upon a notice which they had got stuck upon their tramways that passengers were only carried on the terms that the maximum amount recoverable was £25, and except for that the passenger was carried at his own risk. Counsel contended that there could be no by-law in law which would enable the defendants by merely putting up an announcement to say that they did not care how they injured a passenger, how they shocked him, or how much they offended against the conditions imposed by the Board of Trade. The plaintiff based his case on negligence and breach of statutory duty. The defendants were under an obligation to run tramcars, and they could not, merely by putting up a notice in the cars, make a new contract with the passenger on the terms of the notice, with the result that they were enabled to avoid their statutory duty and limit their liability to £25. When a person travelled on a railway his ticket was his contract; he was not entitled to get into the train until he had got his ticket. It might be that the railway company was entitled to say that the contract created by the issue of the ticket absolved them from certain conditions; but on a tramcar the ticket was not a contract at all. The ticket was a mere voucher that the passenger had paid his money. As a matter of fact, when this accident happened the plaintiff had not taken his ticket; he had not been asked for his money. He was, however, quite within his right in getting on the car, and sitting down without taking a ticket. Counsel, in conclusion, submitted that there was nothing whatever which enabled the defendants to legally limit their liability, and as the plaintiff had no doubt suffered very serious injury, he asked the jury to award substantial damages.

The Plaintiff gave evidence in support of his counsel's opening statement, and medical evidence was given as to the nature of his injuries.

On Tuesday, Mr. Danckwerts, K.C., in opening the case for the defence, said that, first of all, he should rely upon the Corporation's limitation of its liability, and contend that the utmost that the plaintiff could recover was £25. In the alternative, he should submit that the result of the accident was not as serious as the plaintiff's counsel had attempted to make out, and that the plaintiff's present condition was to some extent due to his not carrying out the instructions of his medical advisers. With regard to the first point, he contended, two courses were open to the Corporation: they could charge higher fares and have their liability unlimited, or they could charge lower fares and limit their liability, as, he submitted, they had a perfect right to do. They chose making fares as low as possible, and in doing so they were obeying the wishes of the ratepayers, whom they represented. How the accident could have happened it was impossible to say. On the car was a system of lamps which should show the driver whether or not the equipment was working properly. If the lamps ceased to glow, it showed that something had gone wrong with the insulation, but for some reason or other these signal lamps seem to have failed. The conductor in charge of the car at the time of the accident, called for the defence, said that to the best of his recollection he gave Clarke his ticket before he went up the steps.

In cross-examination, Witness said that he did not know before the accident to Clarke that there was any leakage of electric current. He admitted, however, that the day before, while giving a lady a ticket, he himself was subjected to a slight shock, but did not know whether it was on the same car or not. He reported the matter to the inspector.

Mr. Blain, the tramway manager, said money was taken from passengers before they entered the car. It was not a rule, but it was often done. One of the tramway employés using the car was likely to hand his money to the conductor before going up the steps in order to save his colleague trouble. They had not fixed any workmen's fares along that route.

Medical evidence was called for the purpose of showing that the plaintiff objected to part of the treatment prescribed, and that he left the hospital earlier than he should have done. Evidence was also given to the effect that had the plaintiff followed the treatment prescribed, he could have been effectively cured in six months.

In summing up the case for the plaintiff, Mr. Simon, K.C., said that the only question he proposed to leave to the jury was the amount of damage, as on the pleadings, liability was admitted, and the question of limitation of liability was purely a question of law.

Mr. Dickens, K.C., who now appeared with Mr. Danckwerts, K.C., and Mr. Morton for the defendants, said he did not admit any breach of any statutory obligation. The appliances required by the regulations of the Board of Trade were installed, and it was no breach of the Corporation's statutory duty if these appliances went wrong.

Mr. Justice Coleridge said that they were not supposed to put the appliances there and never look at them.

Mr. Simons said that the rule of the Board of Trade required that a standard should be put upon the car, and means taken to prevent such standard becoming electrically charged, or that apparatus should be fixed which would give a continuous warning signal to the driver.

Mr. Dickens said such warning signal had been fixed, and all he was going to submit was that the Corporation could not, therefore, be liable for not complying with the Board of Trade requirements.

Mr. Simons said his submission was that the defendants could not now set up that they had complied with their statutory obligations. Breach of statutory obligation was alleged and not denied, and under those circumstances it was impossible for the defendants to contend that there had not been a breach of duty. Further than that, the Board of Trade required that passengers must be prevented from travelling on the roof of a car, so long as there was a possibility of receiving an electric shock. That, he submitted, was sufficient to prevent the defendants contending that there had been no breach of statutory duty.

Mr. Justice Coleridge said that the question had better be left to the jury.

Mr. Simons was content so long as it was understood that he did not waive his contention that breach of statutory duty had been admitted. He had electrical experts in Court for the purpose of proving that part of the case, but had not called them because of the admission.

Mr. Dickens, in summing up the case for the defence, said that he should at a later stage submit that the question was purely a question of law—but he should ask the jury to come to the conclusion upon the evidence, that the plaintiff had by his own conduct delayed getting well. He had ignored the ordinary treatment for a year, having had no treatment of any sort or kind whatever. He left the hospital against the express desire of the surgeon and the nurses, and the effect of the accident was not nearly so serious as had been made out.

Mr. Simons was heard in reply, and three questions were left to the jury, viz.: Did the plaintiff take a ticket before the accident? (2) Was Regulation 12 of the Board of Trade complied with? and (3) the amount of the damages.

His Lordship summed up, and the jury, after a brief retirement, found that the plaintiff did not take a ticket before the accident; Clause 12 of the Board of Trade Regulations had not been complied with; and they assessed the damages at £500.

On that finding, his Lordship reserved judgment pending the legal arguments on the question of the Corporation's right to limit its liability.

Mayor, &c., of Bournemouth and Others *v.* Poole and District Electric Traction Co., Ltd.

In the House of Lords on March 1st, the Lord Chancellor and Lords Macnaghten, Atkinson and Collins gave their considered judgment in an appeal argued last sitting and brought by the Corporation of Bournemouth against a judgment of the Court of Appeal in favour of the respondents, the Poole and District Electric Traction Co., Ltd.

The facts have already appeared in the Electrical Review.

Sir Alfred Cripps, K.C., Mr. T. R. Hughes, K.C., and Mr. Cyril Hartree (instructed by Messrs. Sharpe, Pritchard & Co.) appeared for the appellants; Mr. Danckwerts, K.C., and Mr. Tomlin (instructed by Mr. Sydney Morse) for the respondents.

Their Lordships dismissed the appeal with costs.

Oppert *v.* National Electrical Construction Co.

This action was in the list for hearing the other day before Mr. Justice Neville, in the Chancery Division, but upon its being called on, Mr. Howard Wright, who represented the defendants, stated that they had had notice of discontinuance from the plaintiff, who did not now appear. The notice of discontinuance was dated February 25th, and it was served on the defendants on February 26th. They at once applied to the Cause Clerk to have the action removed from the list, but as it had appeared in the list of cases to be heard, he said the matter must come before the Court. Under those circumstances, counsel asked that the action should be dismissed with costs, including the costs of the application.

His Lordship said that under the circumstances, counsel was entitled to the costs of that day's appearance, and made an order dismissing the action, with costs as asked.

Richmond *v.* Lorden.

The Official Referee (Mr. Muir Mackenzie) has made his order in the case of Richmond *v.* Lorden, and has given judgment for the plaintiffs for £79 10s. It will be remembered that Messrs. J. Richmond & Co., Ltd., electric lift makers of London, were employed by Messrs. Lorden & Son, builders, of Croydon, to construct an electric lift on the latter's premises. The lift was duly installed, but defendants refused to pay the balance due on £260 the cost of the lift. They alleged bad workmanship and materials. After hearing evidence at some length in the High Court last month, the learned Referee decided to personally inspect the lift. This he has done, and as a result has given the above judgment.

Owen *v.* Viola.

In the Official Referee's Court on Tuesday, February 23rd, Mr. Chas. Austin Owen, of 46, Sternhold Avenue, Streatham Hill, claimed the sum of £349 13s. 6d. from Mr. Otto Viola, trading in South Molten Street, London, as the Vacuum Engineering Co., makers of vacuum and electrical cleaning plants, &c. Plaintiff was engaged by defendant as traveller and agent for the firm, and the amount claimed was in respect of commission alleged to be due.

Having heard the evidence, the learned Referee (Mr. Pollock) gave judgment for the plaintiff for £292 5s. and costs.

Hill *v.* Bulley.

On Monday, in the Chancery Division, Mr. Justice Warrington resumed the hearing of the action by Mr. A. N. Hill, of Warren Cottage, Kingswear, against Mr. Tom Bulley, a farmer, of Brownstone Farm, Kingswear, for an injunction to restrain the defendant from interfering with plaintiff's alleged rights in a stream on the farm, and so prevent him working machinery for the supply of electric light to his residence.

Mr. Cave, K.C., M.P., represented the plaintiff, and observed that as the case stood when the Court rose on Friday, his Lordship had called upon him to satisfy him that there was a case for the defendant to answer on the claim itself. Counsel contended that he had proved a case which the defendant must answer, and that the defendant had not made out his claim to a right to divert the stream for the irrigation of his meadows and restore the water lower down.

Without calling upon Mr. Terrell, K.C., for the defendant, his Lordship gave judgment for the defendant.

A counterclaim was withdrawn on terms.

Re Electro-Peat Coal Co., Ltd.

On Tuesday, before Mr. Justice Lawrence and a special jury, in the King's Bench Division, was commenced the hearing of an action brought by Mr. James Crossley Barker against the Earl of Mayo, Mr. F. H. Allen, Mr. J. MacGregor, Col. Thos. A. St. Quinton, Sir Leslie Falkiner, Mr. R. Walker, and Mr. G. D. Simpson to recover damages alleged to have been suffered by him by reason of alleged misrepresentations contained in the prospectus issued by the above company. Plaintiff underwrote in all 2,000 shares of £1 each, and applied for 500 firm.

SMOKE ABATEMENT: A SHEFFIELD EXHIBITION.

[from our own correspondent.]

The Sheffield Federated Health Association has celebrated its tenth birthday by organising in the city a comprehensive Smoke Abatement Exhibition and series of conferences which will do much to stimulate the efforts of those pursuing the cult of "the city beautiful."

The Exhibition is the first which has been held in the provinces, and notwithstanding the claim made by the Sheffield authorities that theirs was proved last year to be the sunniest manufacturing city in the kingdom, there is a general consensus of opinion that the Exhibition is being held in the most appropriate industrial centre in England. That Sheffield smoky is Sheffield prosperous is a bye-word with regard to the city of steel, but it is an undisputable fact that the smoke nuisance not only there, but in the other cities in the kingdom, has in recent years abated, owing to the unceasing vigilance of the City Fathers, and the growing co-operation of manufacturers generally.

The Sheffield Exhibition seeks to bring before the public the various appliances which are now on the market for economising fuel and preventing the pollution of town air by smoke, to show the extent to which smokeless power producers, such as electricity and gas, can be employed for manufacturing purposes, and to give both manufacturers and householders a chance of learning how fuel and labour can be saved by the use of scientifically-constructed fireplaces. By a series of conferences, it is also hoped to enable manufacturers and local authorities to compare notes, and discuss the best means of securing effective action in smoke prevention. Three conferences are being held—that on Wednesday was for manufacturers, and those of next week of representatives of local authorities and delegates of voluntary associations.

The Exhibition, which is to last 20 days, was opened in the Corn Exchange on Monday by Sir Oliver Lodge, who delivered an interesting address on "Ruskin, Art and Smoke"; "The City

Beautiful" was his text. Science half-known, he said, had done much to disfigure life, but, better known, it could only beautify and adorn it. The object of exhibitions of that kind was to improve the conditions from which we were suffering, owing to ill-applied or half-applied scientific processes. It was easy to say that smoke was wasteful, that it necessarily meant imperfect combustion. But the unfortunate fact was that smoke was not wholly wasteful. It was economical when there was a varying load, and when it was desired to bank up a fire and wait without doing much work for a time. Also when they had to heat water, anneal armour plates, or heat cold surfaces by means of a flame, a smoky flame was more efficient than a non-smoky luminous flame. The first principle to consider, observed Sir Oliver, was that a flame could not be brought into contact with a cold surface. If an attempt were made to boil water, the flame would not come into contact with the boiler plates or tubes. There could not be combustion below a certain temperature, and the flame was immediately put out. There was a thin film of unburnt gas through which the heat had to pass by radiation, and not by combustion. That was the reason people made smoke if they did it with any thought at all. They found that introducing the hot air which would burn up the smoke reduced the efficiency of their boilers. One remedy was to have studs or projections on the boiler plate which would get red hot and not put out the flame and so carry the heat by induction. The other method was to get good radiation. There was a time when carbon was used for this purpose, but a much better way had been found in the mantle principle. This principle might be applied not only to domestic lighting, but to boiler heating, so as not to depend on hot gases alone, but to have real radiating hot surfaces to send the heat into the boiler. The radiating power increased enormously as the temperature rose, and when good radiation was wanted, there must be high temperature. It was on this sort of principle that economy, efficiency, and smokelessness in boilers, and such like things could be obtained; any boiler which appeared to bring a flame in contact with tubes or water-cooled surfaces, which put the flame out, must be inefficient and smoky. Turning to domestic heating, Sir Oliver said he hoped that one day some town would try the experiment of having the gas made at the coal pit, and bringing it in pipes to the town instead of in trucks and carts, and would forbid the importation of crude coal into the town at all. One town could try the experiment of selling cheap gas for all purposes, and if it succeeded other towns would soon follow the example. He hoped to live to see the day when that was accomplished; and, as a matter of fact, he believed one or two towns in the British Isles were even now thinking about it.

After complimentary remarks from Sir Robert Hadfield and other well-known citizens an inspection was made of the principal exhbits.

In addition to the various appliances for saving fuel and reducing smoke, many other inventions which attack the same problem from different starting points, were shown.

(To be continued.)

BUSINESS NOTES.

Catalogues and Lists.—Messrs. Evered & Co., Ltd., 27-35, Drury Lane, W.C., and Birmingham.—New catalogue of 36 pages giving illustrations, prices and brief descriptive information concerning a variety of electric bells, bell sets, indicators, pushes, and other bell fittings and accessories, also batteries of various types, door, floor, and other contacts, &c.

Messrs. Dorman & Smith, Ordsal Electrical Works, Salford.—New list of their "Thumb" type fuses to meet the large and increasing demand for which, suitable for pressures up to 600 volts, they now make and stock four sizes, viz., 10, 20, 30 and 50 amperes. Hitherto, the fuse has been made in two sizes only, 25 and 50 amperes. It is supplied complete on porcelain base, as well as unmounted for making up distribution boards, &c., different types of terminals being shown to suit different methods of connecting up. Two patterns of iron case are also stocked, one watertight, the other a cheaper form for use where a watertight article is not needed. The list is fully illustrated and priced in detail. The firm also show in this list a new pattern of hand-lamp, which they are placing on the market. It has been designed and made in accordance with the recommendations of the Home Office following the fatalities due to the use of insufficiently protected fittings of the hand-lamp class.

Messrs. Anderson, Anderson & Anderson, Ltd., 35, St. Paul's Churchyard, London, E.C.—List No. 550 (32 pages) giving prices and illustrations of a variety of rubber, cotton, and other goods, including hose, belting, matting, &c.

Messrs. S. H. Heywood & Co., Ltd., Reddish, near Stockport.—Large folding card containing an illustrated description of a 7-ton electrically worked locomotive traverser constructed by them for a works abroad.

Maschinenfabrik "Rheinland" A.G., 31, Duke Street, St. Mary Axe, E.C.—Catalogue of 26 pages containing illustrations and particulars, with tabulated weights, sizes, and prices of journal ball bearings of light, medium and heavy types, and with split sleeve for line shafting; also single and double thrust ball bearings.

The Campbell Gas Engine Co., Ltd., Halifax.—Calendar for the current year commencing with March 1st, each day having a large tear-off slip with the date plainly printed in red.

Messrs. Venner & Co., 6, Old Queen Street, Westminster S.W.—Newly issued list (Section No. 9) in which the Venner time switch is described, as well as a number of selective devices for keeping the switch either closed or open at selected times and on selected days.

Messrs. J. P. Hall & Sons, Ltd., London Road, Peterborough.—New catalogue, well got up, giving full particulars, including specification, line drawings, half-tones, tabulated sizes, code-words, &c., of their various "Hall" pumps for all classes of boiler feeding—compound feed, single-cylinder feed, and differential feed pumps, low service marine, single-cylinder and twin-beam air pumps, oil fuel and ash ejector pumps, &c.

Mr. G. Wuthrich, Oswaldestre House, Norfolk Street, W.C.—New lists of Oerlikon three-phase slip-ring induction motors, No. L32 relating to motors from 20-85 h.p., and No. L32 to those from 2-18 h.p.

Messrs. D. H. Bonnella & Son, Ltd., 58/60, Mortimer Street, London, W.—Small pamphlet in which they give an illustrated description of their "Shadoless" improved candle fitting.

Messrs. Siemens Bros. Dynamo Works, Ltd., 6, Bath Street, City Road, E.C.—This firm are now opening a fittings department, and have issued in connection with that step a new 84-page fittings catalogue, 4B, which is the same size as their recently issued "Tantalum" lamp catalogue, No. 4A. A copy of this fittings catalogue will be forwarded by Messrs. Siemens on receipt of application, accompanied by a trade card. This catalogue should be useful to the trade, as new designs of fittings are illustrated, suitable for "Tantalum" lamps. Many of the fittings are new types designed primarily with a view to giving the maximum amount of illumination. The catalogue includes the numerous leaflets issued by Messrs. Siemens. Among the illustrations we notice a number of interesting views of tantalum arcs, clusters of lamps with holophane reflectors.

Exhibition.—An "Everything for the Home" Exhibition is to be held at Bingley Hall, Birmingham, from October 6th to 23rd next. It is being organised by the International Trade Exhibitions, and will include sections dealing with electric and other lighting, ventilation and heating.

Electricity in Turkey.—Messrs. Warren, Beattie and Co., who for the last ten years have been doing a successful business as electrical contractors on the N.E. Coast, inform us that they have, with the beginning of this year, opened an office in Smyrna. The Messrs. Warren, of whom there are four in the business, were all born in Smyrna (where their father has long held the post of telegraph superintendent to the Ottoman Railway Co.) When last year Turkey was granted Constitutional Government it was decided that a branch in that country would be likely to prove a profitable venture. These hopes are beginning to be realised. The office in Smyrna is in charge of Messrs. A. E. and E. A. Warren, both of whom are thoroughly acquainted with the languages of the Levant, in addition to having had a British technical and commercial training. Messrs. Warren, Beattie & Co., Ltd., out in Turkey represent, amongst others, Messrs. Belliss & Morcom, Ltd., The International Electrical Co. of Liége, the Hart Accumulator Co., Evershed & Vignoles, and the Adams Manufacturing Co. Anyone having inquiries from any part of Turkey which could not be followed up in the ordinary way might communicate with the firm at Lower Commercial Street, Middlesbrough.

Liquidations.—St. Albans and District Electric Supply Co., Ltd.—A meeting is to be held at Electrical Federation Building, Kingsway, on March 31st, to hear an account of the winding up from the liquidator, Mr. James McLeod.

Bartitsu Light Cure Institute, Ltd.—Meetings of creditors and contributories are to be held on March 23rd, at Carey Street, W.C.

Bankruptcy Proceedings.—W. T. Garnett, electric cable and wire manufacturer, Bradford.—A first dividend of 3s. in the £ is payable on March 11th, at the Bank Street, Bradford.

Book Notices.—"Journal of the American Society of Mechanical Engineers." February, 1909. Baltimore, Md. The Society. Price $1.

"Electricity in Factories and Workshops." By A. P. Haslam. London: Crosby Lockwood & Son. 1909. 7s. 6d. net.

"Fortschritte der Elektrotechnik." 1908. Part I. Berlin: Julius Springer. Price M. 10.

"Statistics of Public Education in England and Wales, 1906-7-8." Part II; Financial Statistics. London: Wyman and Sons. Price 9d.

Trade Announcements.—Messrs. Siemens Bros. and Co., Ltd., notify that they removed their offices from 12, Queen Anne's Gate and Queen Anne's Chambers, to Caxton House, Westminster, S.W., on March 1st.

Mr. S. P. Marsh, electrical engineer and contractor, has removed from 5, Castle Buildings, Castle Street, Rugby, to 63, Regent Street, Rugby.

Messrs. A. Emanuel & Sons, Ltd., of 9, 11, and 13, George Street, Manchester Square, W., announce that owing to the termination of the engagement of Mr. J. N. Cooper, as manager, their electrical department will in future be carried on by Mr. E. I. Parkes, who has been with them for over 12 years, during which

he has been intimately associated with the management of that department.

The Humber Electrical Engineering Co., Baker Street, Hull, have acquired the business of Charles Wokes & Co., 68, Brook Street, Hull, and are transferring their business to the latter address, to which all future communications should be addressed. They invite makers to forward latest lists and discounts. Outstanding claims will be dealt with by Messrs. Chas. Wokes & Co., and should be made before March 31st.

We are asked to state that the Mica Plate Co. has now been turned into a limited company under the title of the Mica Plate Co., Ltd. They have terminated all connections with Morris-Hawkins, Ltd., and have now entirely separate works, equipped with the latest machinery. The company's registered offices and works are at Dagenham, Essex. They are manufacturing all classes of insulating work, their speciality being mica plates, tubes, washers and moulded rings. We have received a useful sample book showing the various mica plate, &c., made at their works.

We understand that the Woodhouse patent bonded steel casing will, in the course of a week or two, be placed on the market by the International Electric Co., of 55, Redcross Street, E.C.

Messrs. J. and H. Grevener, of Eldon Street House, London, E.C., have appointed the following agents:—Messrs. Thompson and Ramsay, Castle Chambers, 55, West Regent Street, Glasgow, as agents for Scotland; Messrs. Laidler, Ritchie & Co., Ltd., Nutsford Vale Works, Pinkbank Lane, Longsight, Manchester, as agents for Manchester and district; and the Robinson and Hands Electrical Co., Ltd., 54, Barwick Street, Birmingham, as agents for Birmingham and Midlands.

The offices of the Belgian electrical journal *Electro* have been transferred to 14, Rue du Méridien, Brussels.

Mr. J. S. Frain, formerly power station engineer at Durham, and more recently engaged in the sales department of the Brush Electrical Engineering Co., Ltd., has opened a City of London agency for electrical and allied manufactures, and has taken offices at 15, Queen Street, E.C., where he will represent the interests of several engineering firms.

Japanese Electrification.—The report, which was generally published in the New York daily papers, that an order had been signed for $7,000,000 worth of electrical apparatus and equipment to be used in the electrification of an Imperial Japanese Railway system appears to have been exaggerated and premature. While it is well known that the Government of Japan is considering the electrification of its railways it is practically a certainty that no contract of this magnitude has been signed as yet. A Japanese engineer, who is now in New York, said in reference to the electrification plans of the country: "The Imperial Engineering Corps has recently completed a most exhaustive report upon the practicability and economy of electrifying all the railways of the Empire. The work settled to be done in eliminating steam railway traction in the zone of Tokio is to be begun at once; other sections will be electrified as soon as the money can be found. Japan is well conditioned for generating hydro-electric power. The country is for the most part mountainous and has many rivers and streams that can be made to yield energy for hydro-electric power at very low cost. Such power plants in Japan will never lack abundant water supply. For large units of electrical power and for many kinds of power machinery and apparatus Japan is a good market. The country is not yet supplied with manufactories for the construction of heavy machinery of this kind. Many establishments are making small motors, but we must go outside for our large installations.—New York *Electrical World*.

Patent Application.—Mr. H. A. Mavor and Messrs. Mavor & Coulson, Ltd., of Glasgow, are seeking leave to amend the drawings forming part of Patent No. 8,851 of 1907, for "Improvements in or relating to multiphase electric induction motors." See our advertisement pages to-day.

Meeting of Creditors.—*Re* Celluloid, Ltd.—At a meeting of the principal creditors, held at 110, Cannon Street, on February 15th and again on 16th ult., it was unanimously decided by the principal creditors, who represented about two-thirds of the total unsecured creditors, to advise the acceptance of the following proposition made by the principal French shareholders, which is as follows:—To satisfy in full the trade debts by the transfer of existing 6 per cent. preference shares to the individual creditors. All creditors under £50 to have the option of accepting a composition of 5s. in the £ in lieu of shares. This proposition being subject to the French shareholders finding additional working capital to carry on the business. "The only alternative to this, we are afraid, is to wind up the business on behalf of the debenture-holders, in which case it is not estimated that the assets would satisfy the present debentures in full under liquidation." This notice is signed on behalf of the creditors present by Robert Berk, for F. W. Berk & Co., Ltd., creditors for £920; by James Fletcher, Robert Fletcher & Son, Ltd., creditors for £733; and by A. L. Biggs, B. Biggs & Co., creditors for £168.

Lantern Slides.—We have received from Messrs. Siemens Bros. Dynamo Works, Ltd. (Technical Department), Caxton House, Westminster, a list of a great variety of lantern slides that they have in stock primarily for lending to lecturers, to whom they will be pleased to loan them free of charge. The slides show Siemens manufactures ranging from small supplies to complete electric installations, including turbo-alternator sets at Manchester, mill driving and colliery plants, electric railway work, &c. Each slide bears the firm's name and a brief description suitable for lecture and demonstration purposes.

Tower Wagons.—Messrs. S. Rawlinson & Sons, of Blackburn, have received an order from the Wakefield and District Light Railway Co. for three tower wagons of the screw elevating gear type. They have also received orders for tower wagons from Blackpool, Lytham and St. Anne's Tramways, the Leyland Motor Co., Ltd., Calais Tramways Co., Willesden Urban District Council, and Maidstone Electricity Works.

Spain.—The *Gaceta de Madrid*, of December 27th, published a notice, issued by the Committee for the Protection of National Industry, containing a list of manufactured articles and products, concerning the acquisition of which it is considered necessary, when required for State purposes, to invite foreign competition. This list, which is of considerable length, comprises articles under the following categories:—Iron and steel in its various forms; other metals, such as tin, nickel, brass and copper articles; machinery and machines, such as heavy locomotives, steam turbines, boilers, steam hammers, printing machines, typewriters, bicycles, &c.; electrical material, such as measuring instruments, dynamos, alternators, transformers, motors, cables, &c.; astronomical, meteorological, optical instruments, theodolites, &c.—*Board of Trade Journal*.

LIGHTING and POWER NOTES.

Aberdeen.—In view of the difficulties of the question of charges, a sub-committee reports to the Electricity Committee that it has been unable to deal with the matter, and recommends that the advice of an eminent electrical expert be obtained to deal with both the methods and rates of charges.

Barnstaple.—The B. of T. has informed the T.C. that it hopes to be able to bring in a Bill during the present session of Parliament to amend the Electric Light Acts, with a clause enabling local authorities to provide electrical fittings without having to apply for a prov. order for that purpose.

Blackpool.—An Electrical Exhibition was opened here by the Mayor, on Saturday last, in the North Pier Arcade. The Exhibition will remain open for a fortnight; it includes examples of electrically-driven washing and sewing appliances, medical apparatus, lamp-making, &c.

Bridington.—The T.C. has decided to have a scheme prepared, at a cost of £500, for improving the electrical illumination of the Prince's Parade.

Canada.—The Hydro-Electric Commission has awarded further contracts for transmission lines some 280 miles long to supply Western Ontario towns.

Continental Notes.—Russia.—La Compagnie Centrale de l'Industrie Electrique is the name of a new company which has lately been formed in Brussels with a capital of £40,000. La Société de l'Eclairage Electrique de Saint Petersbourg is interested in the new undertaking.

Derby.—The T.C. has applied to the L.G.B. for a loan of £7,300: for mains and services, £5,500; motors and radiators, £1,000; pipe line between the old and new stations, £300; transformers and transformer chambers £500.

Dublin.—The North Dublin Guardians have decided by 22 votes to 10 to adopt the report of the Electricity Committee as to lighting the Union by electricity in place of gas as at present.

Dundee.—According to reports the delay in completing the new power station has reached an acute stage. A large jute firm has intimated that it will hold the Council responsible for failure to keep an agreement to supply energy by February 1st. This agreement was apparently entered into under the impression that the power station buildings would be complete last November; it is now expected that the station will be able to supply in June, and negotiations are to be entered into with the firm.

Fleetwood.—A L.G.B. inquiry was held on February 23rd into the application of the U.D.C. for a loan of £21,500 for the purchase of the undertaking of the Fleetwood and District E.L. and Power Syndicate. It was stated that the Council had agreed to purchase the E.L. works for £15,000, and the balance was made up of sums for stock, a refuse destructor and the freehold of the works site. There was some opposition, on the alleged ground that the undertaking was not a paying concern, but this assertion was repudiated.

Heston and Isleworth.—Forty-five gas lamps in the streets are to be converted to electric lighting, at a total cost (including services) of £177. In addition, 10 new electric lamps are to be put up in two streets.

Hove.—The electrical engineer has been conducting experiments in the district of Aldrington, in order to compare the cost of street lighting by gas and electricity. His experiments showed for gas an advantage of 3s. 0½d. per post per annum with tantalum lamps (two 23-c.p.); Osram lamps (two 30-c.p. per post) showed electricity to be superior by 1s. 4d. per post, while the high-voltage tungsten 50-c.p. lamps showed a superiority for electricity of 3s. 2d. per post. The latter could also be installed at a slightly lower cost

than the present incandescent gas. The full 50 c.p. is maintained for 1,000 hours of the life of the tungsten lamps, but the engineer found, from tests taken over a number, that the gas mantles varied from 48 to 20 c.p. after 40 hours' burning, giving an average of about 30 c.p. as the average light of the gas lamps. The electric lamps would only require to be renewed 3¾ times per year, as against 12 visits to the gas lamps, so that electricity would entail only one-third of the labour. There would be consequently in Aldrington, with 150 lamps which could be conveniently lit by electricity from mains already laid, a total saving over gas of from £35 to £55 per annum if electricity were adopted. As a further experiment, 35 street gas lamps are to be converted for electricity.

London.—Bethnal Green.—The Works Committee reports having considered communications from the Shoreditch and Stepney B.Cs. respectively, containing proposals to supply electricity in the borough by agreement, under the provisions of the London Electric Supply Act, 1908. The executive officers have gone into the proposals put forward, and also into the question of electricity supply generally. The proposals were the result of concerted action by those authorities, which sought to undertake the supply and distribution of energy in the borough, the area of the same being divided into two parts for that purpose. The rates of charge suggested were those that respectively obtained in Shoreditch and Stepney. The Bethnal Green Committee understands that the proposals can be considered as separate and distinct offers, but as each deals only with part of the borough the Committee was of opinion that the proposals could not be entertained as submitted. The Committee considers that the Bethnal Green authority should now seriously consider steps to provide for the supply and distribution of electricity to persons in the borough, who require it.

Metropolitan Area.—The Asylums Board has approved of a recommendation to adopt an improved electric hand-lamp, costing 6s., in place of the type at present used, and instructions have been issued to the various committees accordingly.

Poplar.—At the meeting of the B.C. on February 18th the Electricity Committee reported that it had considered reports as to the desirability of encouraging the supply of electricity for domestic purposes in order to secure a more diversified load, and to balance the increasing power load on the station. It was suggested that an experiment should be made in this direction by putting in 25 installations, the Council extending the service to consumers to the ceiling rose or wall plug, but not providing the fittings for lighting or other purposes. The proposed charges on these installations would be as follows:—For lighting, £4 per annum per kw. installed, and for heating £1 per kw., with an additional charge in each case of ¼d. per unit for all energy used, and a charge of 12½ per cent. on the Council's cost of installation, to cover depreciation, repairs, and interest. The charge per kilowatt for lighting in cellars, lavatories, &c., would be at the lower rate of £1 where a combined supply for heating and lighting is taken. The Committee recommend that this scheme should be carried out at an estimated cost of £375, and that if the experiment succeeded further extension of the service should be considered. This was agreed to by the Council.

Manchester.—A L.G.B. inquiry has been held into the application of the Corporation for power to modify a scheme in connection with its electricity undertaking, in respect of which in June last it sought powers to borrow £130,500. Under the scheme now submitted the Committee expects to produce on a more economical basis than was possible under the scheme formerly propounded. The saving anticipated, as compared with the former scheme, is at the rate of £2,000 per year.

Middlesbrough.—It is stated that the Ormesby Rolling Mills, Ltd., will shortly begin the construction of large mills at Cargo Fleet, and that these will be electrically driven, the power being supplied by the Cleveland and Durham Power Co.

Newfoundland.—The promoters of the Newfoundland General Electric Co. intend to petition the Legislature for a charter under which a company is to be formed to light Bonavista, Catalina, King's Cove and Trinity by electricity. In addition to electric lighting, the company proposes to run an electric trolley line between Catalina and Bonavista, to erect a marine slip either at Catalina or at Trinity, and to supply electric power to such local factories as the company may find it feasible to establish.

North British Electric Power Syndicate.—A deputation from the Scottish Burghs and Counties was received on Tuesday by Mr. H. J. Tennant, of the B. of T. Mr. A. W. Myles, town clerk of Glasgow, on behalf of those present, suggested that the proposals of the syndicate meant unfair competition, which could be obviated by action on the part of the Board. Mr. Tennant assured the deputation that the matter would receive consideration, and suggested the bringing of a test case against the railway companies in regard to the use of their routes for transmission purposes.

Norton.—A L.G.B. inquiry was held on the 24th ult. regarding a scheme of main and outfall sewerage for Norton, Stockton-on-Tees, which has been prepared by Messrs. D. Balfour & Son, civil engineers, Newcastle-on-Tyne. The sewage from the low-lying portion of the district is proposed to be carried to an underground storage tank, from which it will be pumped into the high-level sewers, either automatically by electric motors if the necessary power can be obtained, or by gas engines driving centrifugal pumps.

Petersfield.—The U.D.C. has decided to apply for a provisional order to enable it to supply electricity to Petersfield and district. The probability is that this order will be leased to a company, but the Council is taking time by the forelock, as it considers that the power should be in the hands of the public authority.

Reigate.—The T.C. has decided to increase the charge for electricity from 7d. and 4d. per unit on the maximum-demand system to 7½d. and 4½d., and on the flat rate from 5½d. to 6d. Discount is also to be discontinued, and meter rents have been fixed at 2s. per quarter up to 18 amperes, and 2s. 6d. for over 18 amperes.

South Africa.—At a recent meeting of the Durban T.C. it was decided that on and after February 1st, 1909, a reduction in the price of electric light shall take effect from 8d. to 7d. per unit, less the usual 10 per cent. discount on all accounts paid within seven days. There was much discussion on the use of the metallic-filament lamp, but in spite of this, the Council felt it was justified in lowering the price, as it had remained at 8d. for the past 10 years, while the cost of production had decreased considerably. In the estimates for the present year, which were considered at the same meeting, the electric light revenue was estimated at £65,135, and the expenditure at £64,794, of which capital charges amount to £34,045. The tramway revenue was put down at £93,626, and the expenditure at £82,766, of which capital charges amount to £37,072, including £7,400 reserve, and £10,860 to the borough fund.

A scheme is being promoted by Mr. W. A. Harper to use the Crocodile River, at a point 170 miles from the Rand, for power development purposes. It is stated that the Victoria Falls Co. has agreed to purchase 40,000 h.p. from the new plant, which will entail an expenditure of some £400,000. Leydenburg, Pretoria, and the Premier Mine would also be possible consumers on the route.

Southampton.—The L.G.B. is to be asked for sanction to borrow £600 for the purchase of meters. The borough electrical engineer reported that he had ascertained that of 56 large towns in England, none are fixing incandescent gas, and the majority are displacing gas with electricity; the remainder have already installed electric lighting in all the important thoroughfares and tramway routes. The engineer pointed out that there are in the side streets of Southampton 1,750 gas lamps and only 38 electric lamps, notwithstanding the fact that the electricity department gave a greater candle-power at the same price. The Works Committee has decided in favour of gas lamps being displaced except in those streets in which experiments have been carried out in respect of automatic lighting and the fixing of intensifiers. The number of gas lamps to be displaced by electric light will, therefore, be 336.

Wednesbury.—The L.G.B. has sanctioned a loan of £1,700 required for laying an underground main from King's Hill, to Darlaston. There has been considerable delay in this matter, because of the difficulty the Corporation had with the Tramways Co., but the work will now be commenced at once, and it is satisfactory to learn that orders for both light and power are being booked. It may be added that the sanction of the L.G.B. has been received without any inquiry.

Willesden. — Negotiations have been in progress between the Council and the North Metropolitan Electrical Power Supply Co. in regard to a proposed reduction in bulk supply charges. Four offers by the company, which have been rejected, represented a saving to the Council of £259, £564, £829 and £1,483 respectively. A further proposition by the company involved an agreement till 1918, which the Council does not feel inclined to enter into, and consequently the negotiations are to be carried on.

TRAMWAY and RAILWAY NOTES.

Aberdeen.—At the half-yearly meeting of the shareholders of the Suburban Tramways Co., it was announced that the B. of T. had not yet appointed an arbitrator to fix the terms on which the company should get electric power from the Corporation, but it was hoped the company would get the matter adjusted soon. It was stated also that the directors will consider as to the payment of a dividend at the August meeting.

Bolton.—The Tramway Committee of the T.C. has decided to apply to the B. of T. for sanction to lay a double line of tramways from Burns Street to Nile Street, and for the doubling and relaying of the track from Bromwich Street to Toothill Bridge.

Continental Notes.—Austria.—A scheme is in hand for the establishment of a public service of electric motor-vehicles between Pressburg, through the Weiss Valley and Eisenbrunnl, Austria. The cars will be on the Mercedes-Stoll system, will take their current from an overhead conductor, the same as electric tramways. The necessary electrical energy will be supplied from the municipal electric station at Pressburg. Seven large vehicles have been ordered for the service.

Portugal.—A scheme formulated by the Municipal Chamber of Coimbra for the installation of electric traction in that town, may be inspected daily until March 12th at the office of the Inspector-General of Telegraphs and Electrical Industries in Lisbon.

F

Folkestone.—The T.C. has unanimously decided to oppose the local tramway company's Bill in Parliament, the objects of which have been referred to previously.

Haslingden.—Since the electric tramways opened last September there has been a loss on the undertaking, estimated at the rate of £1,000 a year. It is expected there will be an improvement in the receipts when communication with Rawtenstall is restored. Meanwhile the Corporation has decided on staff re-arrangements to effect a saving of some £150 a year.

In connection with the through running arrangement the Accrington authorities are considering the provision of additional cars.

Japan.—The Osaka-Takaradzuka electric railway of 15½ miles, and the Minomo-Arima branch of 2½ miles, are to be constructed at a cost of $1,437,500, and a loan for a substantial portion of this amount has been arranged with English capitalists who will carry out the work.

Llandudno.—The Council on Thursday last week held a meeting to consider the proposal to acquire the Great Orme electric tramway, and agreed upon an offer, the amount of which did not transpire. The offer was considered at a meeting of the tramway company shareholders on Friday, when a resolution was passed declining the Council's offer, and asking the Corporation to reconsider the decision declining to run the service on Sundays.

Mirfield.—A deputation of the local Council has interviewed the Huddersfield Tramways Committee in regard to a proposal to extend the Huddersfield tramways to Mirfield. The Mirfield Council is to approach the County Council in regard to certain bridge widening, also the B.E.T. Co., in regard to coupling up the proposed line with its system at the borough boundary.

Paisley.—Col. Yorke last week made a special inspection of a life-saving device which is the patent of Messrs. Bruce and Coutts. Mr. Coutts is manager of the Paisley District Tramways. Col. Yorke expressed the opinion that the invention was a decided improvement on anything he had seen in life-guards, and he congratulated the inventors. A feature of the device is the cushioning effect it has on anyone who may have fallen in front of the car. The driver can instantly by foot action put the guard in action, and the tray cannot rise, but remains in that position till released by him.

Rawtenstall.—The Electricity Committee of the Corporation have appointed a deputation to confer with the Accrington Electricity and Tramways Committee with a view to arranging a through tramway service from Bacup to Accrington, through Rawtenstall. Excellent progress is being made with the electrification of the tramways in the Bacup and Rawtenstall boroughs, and the installation of machinery in the generation station at Hareholm, Rawtenstall, is proceeding rapidly, while the work of extending the tramway depôt has been commenced.

Turkey-in-Asia.—The Beirut electric tramway was expected to be completed for opening in January. Continental capital is largely interested in this enterprise, as also in the Damascus street car system.

York.—A poll of the ratepayers is to be taken in the middle of April on the question of obtaining tenders for the construction and leasing of the proposed electric tramways.

TELEGRAPH and TELEPHONE NOTES.

Jamaica Telephones.—A Jamaica newspaper states that it has every reason to believe that the Government intends taking over the telephone system of Kingston when the present franchise expires next month. If acquired, the system will be extended to several of the principal parishes. The directors of the Telephone Co. are considerably surprised at the decision of the Government, especially after the large expense that was incurred two years ago in restoring the system, which had been completely shattered by the earthquake.

Lake District.—The telegraph has been extended to Wasdale, the wildest of inhabited places in the country, possessing the highest mountain, the deepest lake, and the smallest church.

Somaliland Protectorate.—A copy of the "Wireless Telegraphs Ordinance, 1908" (No. 6 of 1908) has been received, which provides that no person shall use or establish any apparatus or installation for the purpose of operating wireless telegraphs in the Somaliland Protectorate without a licence from the Commissioner.

Telegraph Interruptions and Repairs:—

	Interrupted.	Repaired.
Port Arthur-Chifu	March 9, 1904	
Pontianak-Saigon	Sept. 16, 1908	
Malta-Zante	Dec. 29, 1908	Feb. 24, 1909
Tourane-Amoy	Jan. 19, 1909	
Oran-Tangier	Feb. 20, 1909	
Seattle-Sitka	Feb. 22, 1909	Feb. 26, 1909

Liverpool.—The Post Office has installed a new trunk exchange at a cost of £12,500, to supersede the one erected only three years ago. The traffic is now 9,000 calls per day.

Turkey.—An American Consul reports that telephones are to be introduced into the Turkish Empire and operated by the Government on the same plan as the mail and telegraph services. It is believed that sooner or later the Government will yield to private enterprise on this point.

Wireless Telegraphy.—The chaos which now obtains in wireless telegraph work on the Atlantic coast of the U.S.A. is such that Government interference cannot be long delayed. Numerous private stations exist, some of considerable power, and the confusion which is set up by messages between these stations renders the official stations to a great extent useless.

It is stated that the Eiffel Tower wireless telegraph station is in regular communication with the kindred station at Glace Bay, in Canada, 3,125 miles distant.

Wireless telegraphy has been successfully employed in connection with the fast train service between New York and Chicago, a distance of 900 miles. Communication was effected through wireless stations erected at five different points.

CONTRACTS OPEN and CLOSED.

OPEN.

Algiers.—April 1st. The Prefect of Oran will receive applications for a concession to construct and work electric tramways of about 18 miles in length.

Austria.—Tyrol.—March 20th. The villages of Rian, Judenstein and Tulfes are to be supplied with electric light. Particulars may be obtained from the Gemeinde-Vorstcher, at Rian.

Australia.—Melbourne.—Two multiple magneto switchboards for the incoming junction lines to the P.M.G.'s department in N.S.W. See "Official Notices" February 19th.

Melbourne.—April 23rd. A power plant for the Central Telephone Exchange, Melbourne. See "Official Notices" to-day.

Brisbane.—March 29th. Supply of iron work, insulators, bronze wire and accessories, iron wire and covered wire. Deputy Postmaster-General, Brisbane. Copies of the tender-forms, &c., may be obtained at the Commonwealth Offices, 72, Victoria Street, London, S.W., where also the necessary deposits on tenders may be paid. Specification may be seen at the office of the Electrical Review.

Belfast.—March 8th. Tramway stores for the Corporation. See "Official Notices" February 19th.

March 15th.—Stores for the electricity department. See "Official Notices" February 26th.

Belgium.—March 24th. La Société Nationale des Chemins de Fer Vicinaux (14, Rue de la Science), of Brussels, is inviting tenders for the supply and laying of the armoured electric mains for the light electric railways in the Liége district. Plans at £1 4s., and specifications at 10d., are obtainable from M. C. de Burlet, Director General, at above address.

Elham.—March 11th. The lighting of the workhouse at Lyminge, near Folkestone. See "Official Notices" February 12th.

Germany.—The municipal authorities of Schweidnitz are about to invite tenders for the establishment of a central electric lighting station in the town.

Heywood (Lancs.).—March 6th. Heating, ventilating, and electric light installation at Regent Street Schools for the T.C. H. Cooper Anderson, Architect, 3, Lonford Street, Heywood.

Hornsey.—March 8th. Meters, cables, troughings, &c., for the T.C. See "Official Notices" February 12th.

Hull.—March 9th. Installation of electric motive power at the Workhouse laundry for the Board of Guardians. R. H. Winter, Clerk, St. Mary's Chambers, Lowgate, Hull.

Lancaster.—March 12th. The County Asylum Visiting Committee are inviting tenders for electrical goods. J. R. Wilson, Clerk, The Asylum, Lancaster.

London.—L.C.C.—March 9th. Two 1,500-kw. rotary converters and six 575-kw. single-phase transformers for the Elephant and Castle tramways sub-station; switchgear; electric light wiring for Norwood tramways car-shed. See "Official Notices" February 12th.

Manchester.—March 9th. Electric light materials for a year, for the Great Central Railway Co. (form No. 15); also telegraph materials (form No. 59). Walter Williams, Stores Superintendent, Gorton, Manchester.

Newport (Mon.).—March 22nd. Various lamps and meters for the Electricity and Tramways Department. See "Official Notices" to-day.

Rochdale.—March 17th. Water treatment plant for the Electricity Committee. See "Official Notices" February 26th.

Rotherham.—March 19th. Electrical installation at the girls' secondary school. Holdgate & Harrison, architects, 9, Gray's Inn Square, W.C.

Russia.—The municipal authorities of Orel are about to invite tenders for the concession for the lighting of the public streets by electricity.

Spain.—Madrid.—April 7th. The Public Works Department will receive tenders for the construction and exploitation of a tramway from Termens to Lerida. Particulars may be obtained from the Direccion General de Obras Publicas.

Thirty Hughes telegraph apparatus of the Siemens & Halske pattern are required by the General Post and Telegraph Department.

Tipperary.—March 13th. Lighting the Union Workhouse premises from an electric or other installation. See "Official Notices" February 26th.

Turkey.—The Turkish Post and Telegraph authorities in Constantinople are at present in the market for the supply of 33 tons of copper wire 2½ mm. dia.

Whitchurch (near Cardiff).—March 17th. Electric light sundries for a year for the City of Cardiff Mental Hospital (form No. 24). Clerk and Steward of the Hospital.

Wolverhampton.—March 13th. Tramway track and contingent works (1¼ miles) for the T.C. G. Green, Borough Engineer.

Wrexham.—March 13th. Materials for the Corporation electrical department. See "Official Notices" February 19th.

York.—March 31st. Construction of 5½ miles of light railways in the city, and half-a-mile of railways within the rural district of Escrick, for the Corporation. See "Official Notices" to-day.

CLOSED.

Beckenham.—The Council has sealed a contract with the British Thomson-Houston Co. for the supply of electricity meters.

Blackpool.—The T.C. has accepted the tender of the Rees Roturbo Pump Co., Ltd., of Wolverhampton, for three electrically-driven pumps at the North Shore Salt Water Works.

Derby.—The T.C. has accepted the tender of the British Insulated Wire Co., Ltd., for cable, at £1,047 10s.; and that of Messrs. Babcock & Wilcox, Ltd., for a water softener, at £240.

Dover.—The T.C. has accepted the tender of the British Electrical Transformer Co. for two 50-kw. transformers, at £64 each.

East Cowes.—For lighting the Town Hall by electricity the U.D.C. has received the following tenders:—

Isle of Wight E.L. Co.	£32
Patkey & Co.	45
Smith, Hurst & Co.	57

Edmonton.—The B.G. has accepted the tender of Messrs. J. G. Childs & Co., Ltd., for electric lifts and enclosures at the new infirmary, at £785 and £204 respectively. A list of the tenders appeared in the Electrical Review on February 19th.

At the meeting of the Guardians of the Edmonton Union on February 24th, the consulting engineers, Messrs. May and Hawes, submitted the 24 tenders which had been received for the electric light and power installation for the new infirmary now in course of erection, when it was decided to accept the tender of Messrs. G. Harland Bowden & Co., of Manchester and London, at £2,657.

Farnworth.—The D.C. has placed the contract for the electric fittings for its new town hall and public offices with Messrs. J. W. Singer & Sons, of Somerset.

London.—The Metropolitan Asylums Board has accepted the tender of Messrs. W. J. Fryer & Co., at £35, for the supply of electric radiators for the operating room at the Children's Infirmary.

Bermondsey.—The B.C. has accepted the tender of the British Insulated and Helsby Cables, Ltd., at £47 10s., for the supply of one feeder pillar. Six firms tendered, the prices ranging from £24 15s. to £62 10s.

Islington.—The B.C. has accepted the following tenders for annual supplies for the Electricity Committee:—

Engine room stores, &c.—J. Gibb & Co.
Arc lamp carbons and globes.—Sloan Electrical Co., Ship Carbons, Ltd., City Glass Co.
Oil.—Stern Sonneborn Co., Duckham & Co.
Transformers and accessories.—British Electric Transformer Co., Ferranti, Ltd.
Iron, tools, belting, cotton rope, &c.—J. Gibb & Co.
Earthenware pipes, troughs, bricks, firebricks, clay, &c.—Young & Son, Doulton & Co.
Electricity supply meters and prepayment meters.—British Westinghouse Co., Bat Meter Co.
Cables.—British Insulated & Helsby Cables, Ltd.
Electrical sundries, lamps, brushes, arc lamp parts, &c.—Cryselco Co., Baxter & Caunter, General Electric Co., Heap & Johnson, Johnson and Phillips.
Cable, terminal, service and network boxes and tapes.—Callender's Cable Co., British Insulated & Helsby Cables Co., Lucy & Co., Sykes and Sugden, Johnson & Phillips, India-Rubber Co.

Santa Fé.—According to the *Review of the River Plate* the Santa Fé municipality has received three tenders for the electrification of its tram service, as follows:—

Mr. Donald Tiblon: $75,000 gold, the whole of the property to pass into the hands of the municipality after a period of 60 years.

Messrs. Fleming and Co.: $160,000 paper for existing stock; would construct a new power house and supply the north of the city with light.

Messrs. R. Smiles and J. Wall: Offer $1,200,000 for the existing tram rolling stock and 6 per cent. of net receipts, the property to pass into the hands of the municipality after a period of 75 years.

Southampton.—The Electricity Committee has accepted the following tenders for the annual supply of cables:—

W. T. Glover & Co.—Class A £35, class B £233, class C £318, class D £251.
Craigpark Electric Cable Co.—Class E £96, class F £314, class G £333, class H £95, class I £93, class J £83, and class K £81.

Willesden.—The U.D.C. has accepted the tender of G. & H. Turner for the annual maintenance of the telephone system.

CONTRACTORS' COLUMN.

[The following information is published in the interests of electrical contractors and others who are seeking for openings for new business. Considerable expense is incurred in the production of this column, and every care is taken to ensure that the information is new and accurate, but it will be understood that in a matter where so many correspondents are engaged, and where the amount of information to be handled is very large, this cannot always be guaranteed. If alleged inaccuracies are reported to the Editors, they will be fully investigated.]

ABERDARE.—Two semi-detached villas, for Thomas & Richards; T. Roderick, architect, Clifton Street, Aberdare.

ABERDEEN.—Addition, Royal Infirmary (£15,000); Kelly & Nicol, architects, 367, Union Street, Aberdeen. Workshops in St. Clair Street, for Wm. Adams, cartwright; W. Smith, architect, 43, Westburn Road, Aberdeen. Alterations and additions for Aberdeen Mutual Sawmilling and Boxmaking Co., Ltd.; Taylor & Anderson, solicitors. Alterations for J. Hepworth & Son, Ltd., clothiers, 10, George Street. Alterations at 141 to 149, Union Street; J. & A. Edmond, advocates.

ABERGELE (Denbighshire).—Isolation Hospital; M. R. Jones, Abergele.

ALDERSHOT.—Artillery and Army Service Corps stables and wagon sheds for the War Office (£25,000). Proposed adaptation of building for art gallery.

ARDSTRAW (Co. Tyrone).—Repair and restoration of Presbyterian Church.

ASHTON-UNDER-LYNE.—New school at Hurst, for Lancs. C.C. (£2,089).

ASKERN (near Doncaster).—New coal pit to be sunk; Eaton and Walker.

ASTLEY BRIDGE (near Bolton).—Consumptive Sanatorium, Whitehill, Sharples; Bradshaw & Gass, architects, 19, Silverwell Street, Bolton.

ASTON MANOR.—Underground convenience (£400); F. Richardson, Borough Surveyor.

BARNARD CASTLE.—Isolation hospital; F. D. Stuart, architect, Barnard Castle. Refuse destructor; F. D. Stuart, architect, Barnard Castle.

BARNSTAPLE.—Smithy and store, Newport Road, for T. Lake & Co., iron founders; houses, St. George's Road, for Miller & Essery.

BEDFORD.—Additions to the Anglers' Rest, Clapham Road, for Chas. Wills, Horne Lane Brewery.

BLACKBURN.—New Congregational Church. F. J. Parkinson, architect, 9, Richmond Terrace, Blackburn.

BLACKPOOL.—New Primitive Methodist Church; Rev. J. D. Thompson, pastor, Chapel Street Church, Blackpool. Houses, Warbreck Hill Drive, for J. Fielding & Sons; Middle Lane, for Mrs. Procter; Warbreck Hill Road, for John Gay; Peddars Lane, for J. Moister; Green Avenue, for Jas. Brown; Claremont Avenue, for John Fish; Gloucester Avenue, for John Bamford; Rosebery Avenue, for J. J. G. Hall; Cunliffe Road, for John Cunliffe; Whitegate Drive, for G. F. Clarke; off Preston Road, for Joseph Jackson; picture hall, Tyldesley Road and Rigby Road, for W. Morris; shops and houses, Church Street, for John Fish.

BOLTON.—Ventilating towers and additions to warehouses; Barlow & Jones, Slaterfield Mills. Extension to weaving mill; W. Mather & Co., Peake Place. Alterations and additions at St. George-the-Martyr's School; T. C. Smith, architect, Bolton. Warehouse and shop, John Brown Street; W. H. Pilling. New skating rink; T. C. Smith, architect, Bolton.

BOOTLE.—Elementary school in the Orrell district; Crouch, Butler & Savage, architects, 39, Newhall Street, Birmingham.

BOURNEMOUTH.—Primitive Methodist Church at Springbourne (£2,900).

BRADFORD.—Proposed new Chapel and schools in Central Avenue and Tivoli Place to replace Park Lane Wesleyan Reform Church (£3,000). Suggested new buildings for the Royal Infirmary; G. Priestman, chairman of the House Committee.

BRIDGEND.—Nursery block at the Cottage Homes, for the Bridgend and Cowbridge B.G.; P. J. Thomas, architect, Bridgend.

BRIDGWATER.—New Wesleyan Sunday schools; Rev. J. Bramson.

BRIDLINGTON.—Alterations to 45 and 47, King Street, for J. R. Chew; two underground conveniences, E. R. Matthews, architect, Town Hall, Bridlington.

BRIERLEY HILL (Staffs.).—Council school at Mill Street (324 girls); G. Balfour, Director of Education, Education Offices, Stafford.

BRIGHOUSE.—Baths; Borough Surveyor, Town Hall, Brighouse.

BRISTOL.—New factory for Robinson & Co., seed merchants. Alterations to the Samuel White Council School, Kingswood (£985); E. Clarke and Sons, contractors, Fishponds, Bristol. Extension of Public Museum; T. Yabbicom, City Offices, Bristol.

BROADSTAIRS.—Alterations at the Albion Hotel, including new billiard room.

BURY.—Conversion of Trafalgar cotton mill into Skating Rink, for an Accrington Syndicate.

CALNE (Wilts.).—Drainage and water scheme, for the B.G.; C. H. Smith, surveyor, Chippenham.

CAMBRIDGE.—Additions to pumping station; J. Julian, architect, Guildhall, Cambridge. Motor house and workshop, Grange Road, for W. Sindall, Wordsworth Grove; additions to the University Arms, Regent Street, for M. D. Bradford; additions to brewery, Gwydir Street, for F. Dale, Lensfield Road; motor garage, Hobson Street, for Hunnybun & Sons.

CANTERBURY.—Houses, Oxford Road, Wincheap, Canterbury; J. S. Dodds, builder, 1, Beer Cart Lane, Canterbury.

CARDIFF (Senghenydd).—New church, for the Rev. Lloyd Rees; E. M. Bruce Vaughan, architect, Cardiff.

CASTLEFORD (Yorks.).—School for the West Riding of Yorks. C.C.; architect, County Hall, Wakefield.

CHEADLE HULME (near Stockport).—Residential schools in connection with Henshaw's Blind Asylum, Manchester (£40,000).

CHELTENHAM.—Lavatories (£600); J. S. Pickering, borough engineer, Town Hall, Cheltenham.

CHESTER.—Fire station for the T.C. (£2,140); James Strong, architect. Proposed refuse destructor for the T.C. (£10,996).

CHOPPINGTON.—New school (£6,500); M. Forrest, Moot Hall, Newcastle-on-Tyne.

CHORLEY.—Conversion of premises into club room, with billiard room; Jolly and Buckley, architects, High Street, Chorley.

CLARKSTON (Upper Renfrewshire).—Shop, Clarkston Toll; Mrs. Bryce, Clarkston.

CLECKHEATON.—Secondary and technical school, for the U.D.C.; W. H. Thorp, architect, Phœnix Chambers, South Parade, Leeds.

COLWYN BAY.—Lavatories and conveniences; W. Jones, architect, Colwyn Bay.

COVENTRY.—Wesleyan Church; Crouch & Butler, architects, Newhall Street, Birmingham. Skating rink, Ford Street, for Davenport, Sons & Co.; alterations to Adam and Eve Inn, Eden Street, for Cooper & Co.

CROYDON.—Six houses, Aurelia Road; C. E. Banks, builder, 8, Myron Place, Lee, S.E.

CWM.—Additions to St. Paul's Church; E. Vaughan, architect, Dumfries Place, Cardiff.

DALBEATTIE (N.B.).—Proposed new church at Colvend, near Dalbeattie.

DALTON.—Mission hall; L. Maginton, architect, North John Street, Liverpool; J. & E. Chappell & Co., builders, Liverpool.

DARTFORD.—Additional workrooms, Darenth Asylum (£4,225); W. T. Hatch, engineer, Metropolitan Asylums Board.

DERBY.—Proposed new elementary school in Osmaston Road; secretary, Derby Education Committee.

DODWORTH (near Barnsley).—School for the West Riding of Yorks. C.C.; County Architect, County Hall, Wakefield.

DONCASTER.—New municipal high school for girls; Bottomley, Son and Wellburn, architects, 13, Bond Streets, Leeds.

DROYLSDEN (Lancs.).—Offices for J. Robertson & Son, preserve manufacturers; W. H. George & Sons, architects, 7, Warrington Street, Ashton-under-Lyne.

DUDLEY.—Skating rink, Trindle Road; W. Harper. Twenty-four dwelling-houses, Park Road, Netherton; J. T. Biggs.

DUNDEE.—Alterations to property for A. M. Neill, Americanmuir Road, Downfield, Dundee. Alterations to property for R. A. Dagg, Lochee Road. Stores, &c., for Hailey Bros., Ltd., North Lindsay Street. Warehouse for Don Bros., Bulst & Co., Ltd., South Ward Road. Workshop for J. Nicoll in Russell Street. Alterations to dairy premises for D. C. Guthrie, Old Craigie Road.

EASTBOURNE.—Additions and alterations to garages in South Street, Lushington Mews; A. A. Oakden, architect, 10, Cornfield Road, Eastbourne. Addition to ice works; A. Chandler, architect, c.o. Eastbourne Ice Co., Beach Road, Eastbourne. Six houses, Archery Road; E. Littleton, builder, Firle Road, Eastbourne. Addition to warehouse, Sussex Gardens; Mitchell & Ford, architects, 7, Gildredge Road, Eastbourne.

EAST FERRY (Lincs.).—Elementary School, for Lindsey C.C.; Scorer and Gamble, architects, Bank Street Chambers, Lincoln.

EAST GRINSTEAD.—Alterations to the Court House and police buildings; F. J. Wood, county surveyor of East Sussex, County Hall, Lewes.

EASTLEIGH.—Hall adjoining the Railway Institute; Secretary, L. and S.W. Railway Co., Waterloo Station, S.E.

EAST STONEHOUSE.—Alterations to premises for the Guardians (£763); Thornely & Rooke, architects, 11, The Crescent, Plymouth; D. Carwithen, builder, 45, Trelawny Road, Plymouth.

ECCLES.—Nine houses, Station Road, Patricroft, for A. Lockwood; twenty-one houses and shop, Barton, for J. E. Owen.

EDINBURGH.—Almshouses (£10,000); H. Kerr, architect, 62, Hanover Street, Edinburgh.

EGREMONT.—Wesleyan Chapel; S. Ellison, architect, Sir Thomas Street, Liverpool.

ELDERSLIE (Renfrewshire).—Golf club house and keeper's house, Roundhill Avenue, Elderslie; A. A. Spiers, Elderslie.

ENFIELD.—Church hall for Christ Church Mission; Fairhead & Son, builders, Sydney Road, Enfield.

EPSOM.—House, shop and stables, High Street, for Messrs. Pagden, brewers vestries and organ chamber at St. Barnabas Church.

FARINGDON.—Waterworks plant, pumps, engines, &c., for the R.D.C.; E. Margrett, engineer, 154, Friar Street, Reading.

FENTON (Staffs.).—Fire engine house, residence, &c., for the U.D.C. Twelve houses, George and Tirley Streets; Challinor and Hughes.

FOLKESTONE.—Enlargement and improvement of the Public Library.

FRIERN BARNET.—Refuse destructor; E. J. Reynolds, engineer, Friern Barnet.

GERRARD'S CROSS.—Dairy for J. H. Maggs, 17, Briardale Gardens.

GLASGOW.—Five tenements for Hyndland Building Co., 65, Bath Street. Additions to buildings in Caxton Street, for Barr & Stroud, Caxton Street, Anniesland.

GREENFIELD (Holywell).—New Council school (£5,000); D. Evans, county surveyor.

GRIMSBY.—Proposed new school in the West Marsh district; chairman of the Grimsby Education Committee.

GUNTHORPE (Lincs.).—Elementary School, for Lindsey C.C.; Scorer and Gamble, architects, Bank Street Chambers, Lincoln.

HADLEIGH (Essex).—Council School and cookery centre, for C.C. (£3,685); F. Whitmore, architect, Chelmsford.

HARROGATE.—Extensions at the United Methodist Church (£2,000); Mr. Dinsley, architect, Chorley.

HAVERTON HILL (Durham).—School (£4,500). W. Rushworth, architect, Shire Hall, Durham.

HEBDEN BRIDGE (Yorks.).—New clothing factory at Lewis Holme, for Astin Bros.

HELSBY.—Additions to church; Douglas & Minshull, Chester.

HEREFORD.—Secondary school; R. A. Jack, architect, Shire Hall, Hereford.

HERTFORD.—Territorial drill hall; Ekins & Co., Ltd., builders, Old Cross, Hertford.

HIGHBRIDGE.—Extensions to motor works, after fire; W. W. Buncombe.

HINCKLEY (Leicestershire).—New church, Holy Trinity parish; Rev. C. A. Mayall, vicar.

HOLMFIRTH.—Probable re-erection, after fire, of Co-operative premises, at Wooldale (damage, £5,000).

HORDEN.—Coal mining developments; Horden Collieries, Ltd.

HORNCHURCH (Essex).—Hall in connection with the Congregational Church (£750); Rev. R. Nicholls, pastor-in-charge.

HOUGHTON-LE-SPRING (Co. Durham).—Curate's house, Shiney Row, for Rev. G. F. Holmes. Alterations to Portree House, Shiney Row, for the Shiney Row District Social Club.

HOUNSLOW.—Laundry, London Road; Jose & Francis. Twenty-seven houses: Stanley Road and Livingstone; A. C. Stephens. Four dwelling houses with shops, Bell Row; A. Cutler & Sons, builders, Staines Road, Hounslow.

HUDDERSFIELD.—Post-mortem room, &c., at Storthes Hall Asylum, for the West Riding of Yorks C.C.; County architect, Wakefield.

HULL.—Reconstruction of the Theatre Royal; Sefton Parry Syndicate, Ltd.

ILFORD.—Fourteen houses in Wanstead Park Road and eight in Quebec Road, for W. P. Griggs & Co., The Drive, Cranbrook Park; shop and stable, Green Lane, for Diprose & Knox, builders, 116, Kingston Road; factory, Roden Street, for Walter Fletcher, Ltd. Mission room, Beehive Lane; E. T. Dunn, architect, 20, Mansfield Road.

IVER.—Showrooms and workshops for W. H. Baker.

JARROW-ON-TYNE.—Secondary school, for Durham C.C. (£15,000); F. Rennoldson, architect, South Shields. Additions to Masonic Hall J. H. Morton, architect, 50, King Street, South Shields.

JORDANHILL (Renfrewshire).—Double villa, Southbrae Drive, Jordanhill; Wm. Orr & Co., Crow Road, Partick.

KING'S LYNN.—Destructor at electrical works; J.H. Webb, engineer, King's Lynn.

KING'S NORTON.—Additions to hospital, West Heath; W. Cross, surveyor to U.D.C., King's Norton, Worcester.

KIRKBY-IN-ASHFIELD.—Extension of the gasworks, for the U.D.C. (£6,000).

LANCASTER.—Shop and dwelling house in Sibsey and Kelsey Streets, for R. Parkinson; New Independent Methodist Sunday School (£1,400).

LEEDS.—Restaurant premises, Kirkgate, for F. Klostermann; Thos. Winn and Sons, architects, 84, Albion Street, Leeds.

LISCARD.—Additions to High School (£4,000); J. L. Hughes, architect, 10 Victoria Street, Liverpool.

LIVERPOOL.—Prospective reinstatement, after fire, of flour mills, for Vernon and Sons, Commercial Road, Liverpool; rebuilding of works at Litherland, after fire, for the North-Western Rubber Co; bungalow at Heswall Sanatorium, for the Select Vestry (£1,000). Additions, St. Edmund's School; Powell & Worthy, architects, Lord Street, Liverpool.

LONDON (Lewisham, S.E.).—Additions to 1 and 3, Obelisk Buildings, Loampit Vale; W. Hancock. School in Manor Lane (817 places); T. J. Bailey, architect (education), L.C.C.

(Hackney, N.E.).—Buildings in Castlewood, Moundfield and Ravensdale Roads; P. Roche. Electric switch room at printing works, Downs Park Road, Shacklewell.

(Norwood, S.E.).—Conversion of stables, Knight's Hill Road, into motor garage, for the London General Omnibus Co., Ltd. Buildings in Dumbarton Road; H. Macintosh.

(Wandsworth, S.W.).—Shops at 16-26, Brookwood Road, Southfields, for G. E. Cooper. Iron buildings and other works at Swaffield Road; F. W. Piper, Clerk to the Guardians, Guardians' Offices, St. John's Hill, Wandsworth, S.W.

(Hendon, N.W.).—13 shops, North End Road; Edmondson, Ltd., builders, 9, Broadway, Winchmore Hill, Middlesex. Enlargement of the Parish Church (£6,000).

(Leyton, N.E.).—Additions to All Saints' School, Shortlands Road; J. and J. Dean, builder, Knotts Green Road, Leyton. Fifty-one houses and 34 flats, Sanderstead Road; W. Manders, builder, Leyton Green, Leyton.

(Holborn, W.C.).—Additions to the Cosmo Hotel, J. Savage; new Vestry for the Church of St. George-the-Martyr; buildings, in Sicilian Avenue, Southampton Row, for Selected London Properties, Ltd., Worleys & Armstrong, architects, Aldwych Chambers, 170, Strand, W.C.

(Stockwell, S.W.).—Reconstruction of the boiler house and coal store at the South-Western Fever Hospital, Landor Road; W. T. Hatch, engineer-in-chief, Metropolitan Asylums Board, Embankment, E.C.

(Wood Green, N.).—Fire Station, Muswell Hill; W. P. Harding, clerk to the District Council.

(W.).—New hospital in Bulstrode Street, in connection with the West End Hospital for Diseases of the Nervous System.

(Edgware Road, W.).—Cinematograph theatre; Harris & Gillow, agents for letting site, 451A, Oxford Street, W.

(W.C.).—Buildings in Aldwych for the General Accident, Fire and Life Assurance Co., Ltd.; building, corner of Exeter and Catherine Streets, T. Pocklington.

(St. Pancras).—Buildings in Hampstead Road, for J. Rossdale.

(Strand, W.C.).—Conversion of 7, Burleigh Street into dwelling house; H. Tanner, junr., Carlton Chambers, Regent Street, S.W.

LUNDY.—Coastguard and wireless telegraph station, for the Admiralty.

MABLETHORPE (Lincs.).—Primitive Methodist Chapel; H. Harper, architect, 54, Long Row, Market Place, Nottingham.

MAESYCWMMER (near Cardiff).—Shop, house and bakery, for E. J. Smart, 7, West Avenue; T. E. Richards, architect, Market Square Chambers, Pontypridd.

MALLAIG (Inverness-shire).—Proposed new Church.

MALVERN.—New hospital, Lansdowne Crescent, gift of C. W. D. Perrins, Davenham, Malvern; A. H. Weller, secretary of the Hospital.

MANCHESTER.—Theatre and music hall, Wilmslow Road, Rusholme; A. Winstanley, architect, St. Anne's, near Blackpool. Proposed rebuilding of the Royal Exchange on the site of the old Royal Infirmary; City architect.

(Longsight).—New Wesleyan Church, near Cricket Ground (£1,700).

MANSFIELD.—Additions to tin works, Rock Valley, for Barringer, Wallis and Manners. Additions to factory, Bottle Lane, for the Croft Mill Twist Co. Twenty-eight houses, Rock Valley, for John Parsons.

MARKET DRAYTON.—Proposed secondary schools, for Salop C.C. (£7,165.)

MATLOCK.—New post office in Bank Road, for H.M. Office of Works.

MEATHORP.—Sanatorium; J. Hulton, architect, 22, Highgate, Kendal.

MELROSE, N.B.—Rebuilding the Parish Church; J. M. Dick-Peddie, 8, Albyn Place, Edinburgh.

MERTHYR TYDFIL.—Several pairs of cottage homes at Aberdare, for the B.G.; F. T. James, clerk, 134, High Street.

MEXBOROUGH.—Rebuilding premises for the Barnsley British Co-operative Society, Ltd.; H. L. Paterson, architect, 19, St. James Street, Sheffield.

MIDDLESBROUGH.—Roller skating rink, Linthorpe; Moore & Archibald, architects, Albert Road, Middlesbrough.

NAIRN.—Villa in Young Street for Geo. Tolmie, mason (£650).

NEWCASTLE-ON-TYNE.—New club in Pilgrim Street for the Northern Conservative Club Buildings, Ltd. (electric lighting and lifts); J. T. Cackett, architect, 139, Pilgrim Street, Newcastle-on-Tyne.

NEWCASTLE-UNDER-LYME.—Proposed new Catholic schools; The Managers, St. Patrick's Roman Catholic Schools.

NEW LAMBTON (near Fence Houses).—School (£4,000); W. Rushworth, architect, Shire Hall, Durham.

NEWPORT (Salop).—School (£5,000); H. E. Wale, architect, 11, College Hill, Shrewsbury. Extensions to Edgmond College (£2,500); S. Roper, builder, Wellington, Salop.

NEWQUAY.—Shop and office buildings at Bank Street, for F. Snell; Ennor and Bladen, architects, Newquay.

NORTHAMPTON.—Additions to factory, Clarke Road, for Brook Manufacturing Co. New Parochial Buildings, Craven Street, for the Trustees of St. Lawrence's Parochial Buildings. New Music Hall and shops, Marefair, Horsemarket, and Pike Lane; M. Bromet, builder, 12A, Charterhouse Square, E.C.

NORTHAMPTONSHIRE.—New schools for the C.C. at Daventry (£5,000); Kettering (£17,800); Towcester (£4,200); Wellingborough (£9,650).

NOTTINGHAM.—Proposed new aisle and organ for St. Mary's Church (£7,000; Bishop H. Baynes, incumbent. Schools and technical centre, Stanley Road, for the T.C.; F. B. Lewis, city architect. Albert Hall Institute buildings; A. E. Lambert, architect, 22, Park Row, Nottingham.

OLDHAM.—Extension of Y.M.C.A. premises at Rhodes Bank.

OUNDLE.—Extensions to schools for the Grocers' Co., Princes Street, London.

OXFORD.—Extension of college buildings for Oriel College.

PADIHAM.—Stables, &c., for the U.D.C. (£1,500); Mr. Gregson, surveyor.

PENGE.—Sixteen houses in Green Lane, for Mr. Moat.

PLATT BRIDGE (near Wigan).—Miners' Institute (£2,000); J. B. and W. Thornley, architects, Wigan.

PORLOCK.—New Wesleyan Church; J. Ridler, hon. sec. building fund.

PORTSMOUTH.—Motor garage, 17A, Castle Road, for J. F. Wilcox; C. M. Dash, builder, Clarence Works, Clarence Square, Gosport. Houses in Festing Grove; W. T. Dugan, 8, Prince George Street, Portsmouth. Houses in Bembridge Crescent; G. R. Chamberlain, "Jasmine," 58, Grain's Road, Southsea. Hall, Penhale Road; J. W. Perkins, builder, Rockdene, Wadham Road, Landport. Houses, Twyford Avenue; W. H. Dugan, Twyford Avenue, Portsmouth. Houses, Milton Road; J. J. Rogers. Additions to Jewish Synagogue, Queen's Street; A. E. Emanuel, J.P., St. Edward's Road, Southsea. Waiting room, King's Theatre, Albert Road; J. Boughton, Portsmouth Theatres, Ltd., Commercial Road, Portsmouth.

PRESTWICH (near Manchester).—Reconstruction of administrative block at the County Asylum, for the Lancs. Asylums Board (£13,500); Mr. Chadwick, architect, Manchester.

READING.—Probable reinstatement, after fire, of premises, Yield Hall Foundry, for R. Wilder (damage, £2,000).

REDCAR.—New pavilion on the Pier (£1,600).

ROCHDALE.—Branch shops and nine houses for the Equitable Pioneers' Co-operative Society; H. H. Clough, architect, Butts Avenue, Rochdale. New convenience and alteration to buildings, at Sudden; S. S. Platt, borough surveyor, Town Hall, Rochdale.

ROMSEY.—Work at the Abbey (£1,094); Cornish & Gaymer, contractors.

ROTHIEMAY (Aberdeenshire).—Alterations at school; W. L. Duncan, architect, Turriff.

RUGBY.—Additions to the Wood Institute, for the U.D.C. (£1,175); houses, Princes Street, for O. Avery; William Street, for C. M. Patchett.

SABDEN (near Blackburn).—Additions to works, for the Printing Co. (several thousand pounds); new Baptist school and Chapel (£5,000).

ST. MONANCE (Fife).—Relighting the United Free Church buildings.

SALFORD.—Alterations to Pendleton branch library (£300); J. Corbett, engineer, Salford T.C. Two Council schools, Ordsall district (architect to be appointed); extensions to oil works, Ouse Street, Pendleton. Public conveniences (£3,650); J. Corbett, surveyor to Salford Borough Council.

SALISBURY.—Hospital for the Salisbury and District Joint Hospital Committee (£15,000); J. H. Goodman, architect, Town Hall Chambers, Blagrave Street, Reading.

SALTBURN-BY-THE-SEA.—New parochial hall (seat 500).

SAWLEY (Derbyshire).—Proposed new Church; Bishop of Southwell.

SCAMPTON (near Lincoln).—Primitive Methodist Church; W. Greenfield, architect, Boston.

SHEFFIELD.—New library and vestry in connection with Stanley Street Church; probable re-erection, after fire, of portion of premises in Cavendish Street, for H. Hill, Ltd., cycle and motor accessory manufacturers.

SHIPLEY.—Sixteen houses, Lovelace and Back Roads, for J. Bickerdike; workshop extensions, Thackley Old Road, for Illingworth & Co.; motor garage, Bingley Road, for J. W. Ferguson.

SOMERSET BRIDGE.—School (£2,250); A. Cottam, architect, Bridgwater; J. Fursland, builder, Bridgwater.

SOUTHAMPTON.—Twenty-two houses, Newcombe Road; W. H. Masters, architect, 58, Regent Circus, Swindon, Wilts. Chapel, lodge and offices in new cemetery; J. A. Crowther, borough engineer, Southampton.

SOUTH DARLEY.—Water supply scheme for the U.D.C. (£4,000); H. Taylor, engineer, Newcastle-on-Tyne.

SOUTHEND.—Business premises, 30, Christchurch Road, for Worth & Co. Houses, shop and stable, Bournemouth Park Road, for J. Brace. Alterations and additions to Royal Sanitary Laundry, Coleman Street, for H. J. Glynn.

SOUTH SHIELDS.—New Church of St. Oswin (£3,500); Henry Grieves, architect, South Shields. New collieries near South Shields, for the Harton Coal Co. Y.M.C.A. premises; J. H. Morton, architect, 50, King Street, South Shields.

STOKE-ON-TRENT.—House, shop and warehouse in Corporation Street; Mr. Trigg. Shelters and conveniences. Recreation Grounds, for the T.C.; A. Burton, Borough Engineer and Surveyor.

STOURBRIDGE.—New School at Wordsley; Director of Education, Education Office, Stafford.

SUNDERLAND.—Church, Grangetown; C. H. Fowler, architect, The College, Durham.

SUNNINGDALE (Berks.).—Club premises on the golf links; H. Charman, builder, Ascot. Branch for the London and Provincial Bank; Rice & Co., builders, 15, Stockwell Road, London, S.W.

SWANSEA.—Extensions to Mackworth Hotel for R. E. Jones & Co. Private telephone system for the B.G.; Ll. Jenkins, clerk, Union Offices, Alexandra Road. Alterations to Secondary Schools; G. Bell, borough surveyor, Swansea Town Council. Combined refreshment room, bowls house and shelter, Brynmill Park; D. Bliss, superintendent of Parks, Swansea T.C. Six houses, Port Tennant, for Swansea Harbour Trust.

TAUNTON.—Residences for officials on old gaol site; G. I. Simey, Somerset County Council Offices, Bath.

TEDDINGTON.—Sewerage scheme for the U.D.C. (£35,865).

THORNTON-IN-CRAVEN (near Leeds).—New church at Earby (£4,000); Thorman & Bromet, architects, Tadcaster.

TORQUAY.—Important extensions to Babbacombe Hall Hotel, for Mr. Harding.

TRURO.—New chapel for the Diocesan Training College (£1,200).

TWICKENHAM.—School, Hartington and Napoleon Roads; H. J. Saunders, secretary, Twickenham Education Committee. Eight shops and dwelling houses, Nelson Road; H. Goadby, architect, Bank Chambers, London Road, Twickenham.

WARRINGTON.—Additions to works, Dalton Bank, for Rylands Bros.; additions to works, Longford, for the English Products Co., Ltd.; eleven houses, Powell and Forrest Streets, for J. P. Booth.

WATERLOOVILLE (Cosham, Hants.).—New school; F. J. Privett, builder, Southsea.

WESTCLIFF-ON-SEA.—Boarding house, Pembury Road (£1,529); D. H. Smith, architect, Westcliff; W. Houghton, builder, Southend-on-Sea, and 1, Finsbury Square, E.C.

WESTGATE-ON-SEA (Kent).—Roman Catholic Church (£14,000); Ekins and Co., builders, Old Cross, Hertford.

WEST HARTLEPOOL.—Theatre, Lynn Street (£20,000); R. Thornton, Theatre of Varieties, South Shields.

WHITCHURCH (Salop).—High school for girls, for the C.C.

WIMBORNE.—Primitive Methodist Chapel at Ferndown (£700).

WINDSOR.—Probable re-erection, after fire, of furniture depôt, 77, Plascod Street, Mark Davies, occupier; Exors. of Sir J. H. Long, owners.

WIRKSWORTH.—Improved sewerage scheme (£2,000); Surveyor, Council Offices, Wirksworth.

WOODFORD.—New Wesleyan Church, Highams Park (£1,200).

WORKSOP.—Offices in Carlton Road, for Waterworks Co. (£1,700); A. H. Richardson, architect, Market Place, Worksop; Perks & Sons, Ltd., builders, Long Eaton. Showrooms, Bridge Street, for Shaw & Son.

YORK.—Motor garage for the North-Eastern Railway; Wm. Bell, architect to the N.E.R. Co., York.

YSTRAD MYNACH (near Cardiff).—Offices at Penallta Collieries, for the Powell Duffryn Steam Coal Co., Ltd.

FORTHCOMING EVENTS.

Northampton Institute Engineering Society.—Saturday, March 6th.—Visit to the National Physical Laboratory.

Friday, March 12th.—Paper on "Smoke," by Mr. W. Longland.

Institution of Electrical Engineers (Manchester Students' Section).—Saturday, March 6th.—Visit to the Electrical Installation of the Collins Green Colliery Co., Ltd., Earlstown.

Royal Institution.—Saturday, March 6th. At 3 p.m. Lecture on "Properties of Matter," by Prof. J. J. Thomson. (Lecture II.)

Working Men's College, Crowndale Road, N.W.—Saturday, March 6th. At 8.30 p.m. Lecture on "Some New Phenomena of the Electric Spark," by Prof. A. W. Porter.

Institution of Mechanical Engineers (Graduates' Association).—Monday, March 8th. At 8 p.m. Paper on "Producer Gas," by Mr. G. H. I. Cruse.

Royal Society of Arts.—Monday, March 8th. At 8 p.m. Cantor Lecture on "Modern Methods of Artificial Illumination," by Mr. L. Gaster. (Lecture IV.)

Wednesday, March 10th.—At 8 p.m. Paper on "The Application of the Microscope to the Study of Metals," by Mr. W. Rosenhain.

Institution of Electrical Engineers (Glasgow Section).—Tuesday, March 9th. At 8 p.m. Meeting at 207, Bath Street, Glasgow.

Institution of Electrical Engineers (Manchester Section).—Tuesday, March 9th. At 7.30 p.m. At the University, Manchester. Paper on "Electric Traction Vagabond Currents," by Messrs. R. G. and J. G. Cunliffe.

Association of Engineers-in-Charge.—Wednesday, March 10th. At 7.30 p.m. At St. Bride's Institute, E.C. Paper on "Indicator Diagrams," by Mr. W. A. Tookey.

Institution of Electrical Engineers (Birmingham Section).—Wednesday, March 10th. At 7.30 p.m. At the University, Birmingham. Paper on "Extending the Limits of Power Transmission," by Mr. A. M. Taylor.

Institution of Electrical Engineers (Dublin Section).—Thursday, March 11th. At 8 p.m. Meeting at the Royal College of Science, Dublin.

Institution of Electrical Engineers (London).—Thursday, March 11th. At 8 p.m. At the Institution of Civil Engineers. Paper on "The Dielectric Strength of Compressed Air," by Mr. E. A. Watson.

Physical Society.—Friday, March 12th. At 8 p.m. At the Imperial College of Science, South Kensington, S.W. Papers on "The Effect of Radiations on the Brush Discharge," by Mr. A. E. Garrett, and "Pirani's Method of Measuring the Self-Inductance of a Coil," by Mr. E. C. Snow; "Exhibition of a High Potential Primary Battery," by Mr. W. S. Tucker.

Royal Institution.—Friday, March 12th. At 9 p.m. Discourse on "Modern Submarine Telegraphy," by Mr. S. G. Brown.

Saturday, March 13th.—At 3 p.m. Lecture on "Properties of Matter," by Prof. J. J. Thomson.

Appointments Vacant.—Haslingden Town Council, on February 25th, decided to appoint a foreman of the destructor works, who would be required to attend to the boosters, switchboard, and engine for the electric tramways. Junior shift engineer (25s.) for Southport.

Inquiries.—Makers of "Directon" switches, and Invar wire.

THE ELECTRICAL ENGINEERS
(LONDON DIVISION).

The following orders are issued :—

Commanding Officer—Col. R. E. B. Crompton, C.B.

Monday, March 8th.—"A" Company. Infantry drill (recruits), 6 to 7 p.m. Technical drill, 7 to 10 p.m.

Tuesday, March 9th.—"B" Company. Infantry drill (recruits), 7 to 7.45 p.m. Technical drill, 7 to 9.30 p.m.

Thursday, March 11th.—"C" Company. Infantry drill (recruits), 6 to 7 p.m. Technical drill, 7 to 10 p.m.

Friday, March 12th.—"D" Company. Infantry drill (recruits), 6 to 7 p.m. Technical drill, 7.15 to 9.30 p.m.

Saturday, March 13th.—"B" Company. Week-end run at Coalhouse Fort.

Monday, March 8th.—"A" Company. Smoker at Headquarters, at 8 p.m.

(Signed) J. H. S. Phillips,
Capt. and Acting Adjutant.

NOTES.

The Thwaite Appeal: Death of Mrs. Thwaite.—That the terms of the appeal that appeared in our pages were none too urgent, finds sad confirmation in the news that reaches us that the widow of Mr. B H. Thwaite succumbed to her very distressing illness on Saturday last. The two children are now left alone quite unprovided for apart from what may be obtained as the result of the appeal. We are sorry to learn that the fund is still progressing very slowly; a further £160 is needed in order to make up the £500, upon the collection of which Mr. Carnegie's donation of a like amount depends. We trust that the need that has now arisen for more immediate action on behalf of the son and daughter will appeal to the hearts of many who, though admirers of their father's versatility and his services to science and engineering, have not as yet subscribed.

The Electrical Section at this Year's "White City."—In connection with the Imperial International Exhibition, which is to open at the "Great White City," Shepherd's Bush, in May next, a Committee has been formed to look after the interests of electricity. Mr. F. J. Walker, M.I.M.E., will act as chairman, and the other members are:—Messrs. H. W. Bowden, A. F. Berry, H. Hirst, Leonard Holmes, G. O. Grimshaw, H. W. Miller, T. W. Wallis, J. C. Dyas, C. Wilson, A. T. Turney and C. S Leach. The proposals, so far as they have gone, may be gathered from the following circular, which has just been sent out by the hon. secretary to the Section, Mr. F. B. Converse:—

"I am instructed to inform you that an Organising Committee of the Electrical Section of the Imperial International Exhibition, 1909—comprising representatives of various branches of electrical industry—has been formed, to organise the *British* Electrical Section at the forthcoming Exhibition to be held at the Great White City, Shepherd's Bush, which will be opened early in May.

"It is the desire of the Committee that this Section shall be fully represented and worthy of British electrical science and industry from all points of view—historical, scientific and commercial.

"Already space has been applied for by, or allotted to, representatives of the Electrical Sections of the American, German and Swiss Industries. You will, therefore, no doubt, wish to support the British Electrical Section by a display representative of your particular branch.

"In the Machinery Hall, a space of about 10,000 sq. ft. has been offered by the Exhibition authorities for prompt acceptance, and an additional space equivalent to one-third of this amount has been kindly promised free of all rental charges by the Exhibition authorities for the Historical, Educational and Scientific Sections only.

"The Committee has also favourably considered the suggestion to erect and equip a large electrical village, instructive and interesting to the various sections of the public, on a space adjoining the British Electrical Exhibits and next to the Machinery Hall.

"It is proposed that the Village enterprise should be undertaken by an existing organisation under the control of the Committee, and negotiations to that end are proceeding.

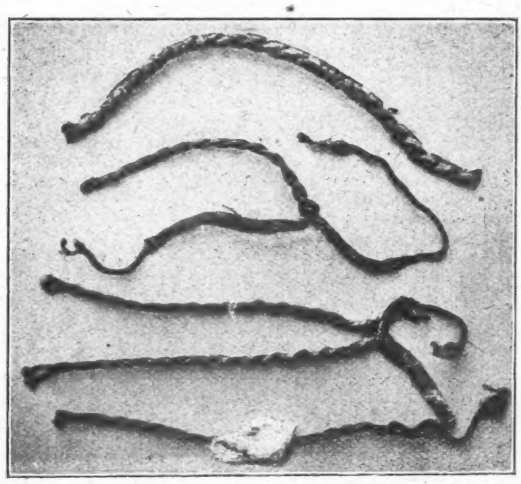
"The cost of the space in the Electrical Section of the Machinery Hall will be in accordance with the schedule contained in the enclosed form if application is made direct to the Exhibition authorities. If, however, applications are made through the Committee to such an extent as to enable them to secure the block of 10,000 sq. ft., the price will be 4s. per sq. ft., and reduced to 3s. 6d. per sq. ft. for working exhibits—*i.e.*, machinery in operation or motion.

"The Committee would be pleased to receive from you suggestions which will help forward the organisation of this scheme."

Fire Tests.—A series of fire-resisting doors were under test at the British Fire Prevention Committee's Testing Station on the 24th ult., there being four doors under review—*i.e.*, an "armoured" (tinclad) door, an iron door, and two composite doors. The tests were high temperature tests, up to 1,800° F., followed by the application of water from a steam fire engine.

The Use of Flexible Wire for Interior Work.—A good deal of controversy has lately been proceeding on the subject of the proper or improper use of flexible wires for the interior wiring of house installations, and strong expressions of opinion adverse to the adoption of this method of conducting electricity have been uttered by experts, who are, no doubt, led to their opinions by unhappy experiences with this class of material. It is, however, best to show both sides of the shield, and we therefore reproduce an illustration of some samples of flexible wire which have been forwarded to our offices, and which we have ourselves had the opportunity of inspecting. It is rather unfortunate that we do not publish illustrations in colour, as the full beauty of the specimens is not brought out.

It may, however, be said in explanation that the samples of wire submitted are by no means of the best quality, all but the middle specimen being insulated only with cotton and pure rubber, and are in no way specially treated in order to avoid leakage troubles, or other dangers. They are, however, liberally coated with a mixture of plaster and paint, which one would imagine would be highly deleterious to the insulating properties of the



covering, and it will be seen that in one portion the wire has actually been embedded in the plaster work of the ceiling. The curious point about the matter is that this wire has been in actual and continuous use for six years under a pressure of 200 volts, and has during that time given absolutely no trouble, either from leakage or any other symptoms of failure. The only reason for the removal of this wire was that certain extensions and alterations being necessary, it was decided, as a matter of convenience, that the existing wire should be taken out and replaced with a more modern system. Had this not been the case we should probably have been unable to refer to this curious contradiction to present-day theories.

We are indebted to Messrs. Robson & Coleman, electrical contractors, of Newcastle-on-Tyne, who, in the course of their alterations, came across this unique specimen and very kindly forwarded the same to us for our inspection.

The Metric System.—The adoption of the metric system abroad continues to make progress. Denmark recently made it obligatory in the computation of taxes and Customs dues, as from April 1st next year, and it will be made compulsory for all purposes two years later. China has standardised her unit of length in centimetres, and Japan has officially approved of the system. Russia established it in Finland long ago, and like Japan and the United States, employs it in the medical services of the army and navy. The American units of measurement are by law based upon the metric standards, and the eventual adoption of the system in the United States is certain. Our own colonies have spoken clearly on the subject; they wait for us alone. In Europe only Turkey, Greece, and the United Kingdom stand aloof.

Electric Haulage on Canals.—The development of electric haulage has made considerable progress on the French canals; the Société de Halage Electrique has lines extending 83 km. along the Aire, Deule and other canals, where the traffic is very important, the up-stream traffic of the Sensée canal in 1907 amounting to nearly 3½ million tons. The company has 30 Galliot-Denèfle tricycles in use, over a length of 25 km.; the rest of the system is served by 60 four-wheeled tractors running on rails. The latter are really locomotives, and were designed by M. Chanay, director of the company. The total weight of each tractor is about 10 tons; it is driven by two tramway motors developing 20 H.P. at 550 volts, through double-reduction gear having a ratio of 14·4 : 1. The tractive force developed varies from 1,200 kg. at 3 km. per hour to 300 or 400 kg. at 5 km. per hour; the speed running light is at least 14 km. per hour. The usual speed, hauling three or four boats, is 3 km. per hour, with a consumption of 4 watts per ton-km. The cost of maintenance is extremely small. Power is supplied at 500 volts D.C. by an overhead wire. There are five sub-stations, fed with three-phase current at 5,000 volts, and spaced 12·5 km. apart. The price charged is 0·035 fr. per ton-km. up-stream.

Annual Dinners.—The General Electric Co., Ltd.—On Saturday last the nineteenth annual dinner of the company was held at the Trocadero, the chairman (Mr. G. Byng) presiding. Covers were laid for 480, and the guests included, besides practically all the departmental managers, a large number of central station and consulting engineers, contractors, and other friends and clients of the company.

After the loyal toasts, the chairman proposed "Electrical Science and Industry," referring first to the early days, just before the Crystal Palace Exhibition of 1887. Those were, he said, delightful years for electricians. He recalled the work of Prof. Ayrton, Reckenzaun, Hammond, Mordey and others; it was all "first" then—the first dynamo, the first lamp, the first carbon, and so on. In those days they manufactured, and their professors told them how they did it. They sent electrical goods to all parts of the world, and taught foreigners electricity; every fundamental invention then was an English invention, and in matters electrical England led the world—20 years ago.

To-day, were they still leading? He was afraid they were not. British electrical industries were still vast, important and virile, but they had lost their lead, and had to follow in matters electrical. Why?

It was still not too late to regain their position; they must diagnose correctly the reason of their loss. There must be some difference in the conditions. They still had their scientists and workmen, the demand, the money and the enterprise. He knew of no war or other calamity which would account for it. Some said it was mistaken legislation, but he thought that a small matter; it was not technical education—he knew both foreign and English schools, and he would not agree that in education this country was behind. The difference lay in the methods by which foreign Governments supported industry; while foreign manufacturers of electrical machinery flourished under a Protectionist tariff, they in this country languished under a system of free imports. There were many who did not agree with him, and he would give a prize of 20 guineas to anyone who proved that he was mistaken; the judge might be Mr. Swinburne, or Col. Crompton (who was worse), or the editor of the Electrical Review (who was the worst of all). He would only stipulate that the stakeholder should be of the same opinion as himself.

Eight years ago he prophesied that by 1912 Free Trade in England would come to an end; he believed his prophecy would come true. Then electrical engineers and manufacturers would work under the same conditions as their foreign competitors; that was all they asked for—then they would prove that British industry could regain its pre-eminent position. They had done wonders under the present disadvantageous conditions; then their order books would be full, their factories busy, their pockets full, and their work-people would get a rise. When that glorious time came, they would make the British electrical industry the foremost in the world.

Replying on behalf of the industry, Mr. W. M. Mordey suggested that that splendid assembly proved that there was another side to the question. As President of an Institution numbering over 6,000 members, he pointed out that that fact alone indicated that the British electrical industry was highly successful and progressive. One of the most potent supporters of the industry was that great company, which employed between five and six thousand persons; it was largely due to the company that they had stemmed the tide of foreign invasion. Mr. Byng had established that great business by making proper use of material imported from abroad because he could not obtain it in this country. As the result of recent inquiries, he found that not more than 4 per cent. of the plant installed in British supply works was of foreign origin. Considering the early start of gas, and its immense advantages for lighting and cooking in small houses, it was a remarkable fact that in London the electrical revenue per inhabitant was 9s. per annum—nearly half as much as the revenue from gas (20s. 6d.). There was a great future for electricity for heating and power, and especially for cooking, in which it might be greatly assisted by Prof. Dewar's thermo flasks. Manchester Corporation was already supplying 50 units per inhabitant per annum (or 82 units, including tramways); he hoped to see 200 units supplied per inhabitant—at Prescot 170 units had been reached. He believed they were still leading in the supply and utilisation of electricity in Europe (in America the conditions were different). The manufacturers might not be as happy as they might be under certain conditions, but the consumers were better provided for than in any other country.

Dr. Glazebrook also replied, and emphasised the importance of close union between science and industry, a factor which had enabled other countries to go ahead faster than this. British firms were changing their attitude towards science, and he saw in that fact great hopes for the future.

Mr. R. Hammond proposed "Imperial Trade" in a racy speech, pointing out that England must have food, and the only way to pay for it was by trading. That trade was due to individual preference for British goods, and was only possible while that preference was maintained; it was largely due to the determination of the Colonial agents to use British goods wherever possible.

Replying to the toast, the Hon. C. H. Rason, Agent-General for Western Australia, said that that word "preference" appealed to the part of the Empire that he represented; he would prefer that this country should do a large trade within the borders of the Empire itself. With a population of four millions, Australia had an annual trade of 125 millions; what would its trade be when the population was 40 times as great? He gloried in the fact that Australians gave a preference to the mother country, but regretted that the trade of the mother country with Australia was not increasing in proportion to the trade it used to have. The colonies placed orders with the mother country even at a pecuniary sacrifice, but he saw no such example of the affection of the mother country for her colonies. Everything that they required could be obtained within the borders of the Empire, and they should endeavour to be brothers in trade as well as in affection.

Mr. E. Grant Burls (Director-General of Stores, India Office) also replied, remarking that he never let an order go abroad if he could help it. Last year the General Electric Co. had completely equipped the Calcutta Mint with electric light and power, the finest installation of its kind anywhere, while the Mint in London had no electrical plant, and, he believed, was not lighted by electricity.* He reminded Mr. Rason that he had placed large orders in Australia.

Mr. F. H. Medhurst proposed "The Electrical Press," and Mr. R. W. Weekes responded.

Lastly, Prof. S. P. Thompson proposed "The General Electric Co.," and recalled its growth from a little shop to its present immense development. The name of the company was known throughout the world.

Mr. Hirst responded to the toast, attributing the success of the company to its staff. Whilst the latter maintained its qualities, he had no fear for the progress and prosperity of the company, which had been accepted by the country almost as a national institution.

During the evening a musical programme was performed by the London Orchestral Band, and an excellent entertainment was provided by Mr. Arthur Prince, Mr. Nelson Jackson, and Dr. Byrd Page.

Institution of Electrical Engineers (Manchester Section).—The annual dinner of the Manchester Section of the Institution was held at the Midland Hotel, Manchester, on Friday last, when about 130 members and friends were present. Mr. Miles Walker, Chairman of the Section, presided. After the loyal toasts had been duly honoured, Mr. S. Z. de Ferranti proposed "The Corporations of Manchester and Salford." Referring to municipal trading, he said he did not agree with municipalities trading at all, but if they did trade they should take the risks of private traders, and not be bound by all sorts of ideas and fads. In Manchester the Corporation had a monopoly of electricity supply, and having such should have the opportunity of doing its business well, and he deprecated interference with those concerned in the working of municipal trading departments. Municipalities had done a great deal of good and developed electricity supply, but they had done a deal of harm by letting contracts on the basis of the lowest tender, and he considered that no trading would be successful which was based on unlimited competition. If they had no margin of profit they had no opportunity of development, and consequently nothing to spend on experimental work. The Mayor of Salford (Alderman Jenkins) responded in a humorous speech.

Mr. H. T. Crook (President of the Manchester Section of the Instiuttion of Civil Engineers) proposed the "Institution of Electrical Engineers." Mr. W. M. Mordey responded, and referred to the help they had received from the Institution of Civil Engineers. Municipalities might have their faults, but Manchester supplied 82 B.T.U. per head of population for tramway, power and lighting purposes, and did it at a price as low as any in the country. The average price for lighting was 1·131d. per unit, and for power just over ¾d. per unit. With regard to the present and future of electrical engineering, they were being told that trade was bad and was suffering a check. One of the causes was the introduction of the metallic-filament lamp; this would only be of a temporary nature, and would lead eventually to the greatly increased use of electricity for lighting purposes. The supply of trained electrical engineers was at the present time greater than the demand. There had always been unemployment in this country, and always would be; it was one of the causes which had made this country such a great colonising nation. It was not a question of free trade or protection, but one of birth-rate. He believed in buying in the cheapest market, though, of course, he wanted to be sure that it was the cheapest. Mr. F. Gill proposed the "Local Sections," replying to which Mr. Miles Walker said that the members of the Local Sections formed 20 per cent. of the membership of the Institution; but there were a great many electrical engineers who were not yet members. It was their duty to induce such to belong to the Institution representing the profession. Mr. S. J. Watson proposed "The Visitors," and Prof. Rutherford responded.

The annual festival of the employés of the Glasgow Corporation electricity department was held on Thursday evening last week in the City Hall. Bailie J. W. Stewart, convener of the T.C. Electricity Committee, presided, and referred to the great progress which had been made in electric lighting and power supply in Glasgow. He pointed out that when the department was started the employés numbered something like 100, while now nearly 900 were engaged and the output had increased in a similar ratio.

Electric Piano Player.—At a meeting of the New York Electrical Society recently, Dr. John F. Kelly, president of the Telelectric Co., delivered a lecture on "The Development of the Electric Piano Player," outlining the problem of producing the required electromagnetic devices for the so-called electric player, and explaining the methods used for controlling the speed, touch, expression and accentuation. As now constructed, the electric piano player affords control of the individual notes to such an extent that the melody is properly accentuated in distinction to the accompaniment, while the time is under perfect control, and the harmony is mathematically exact.—*Electrical World.*

* The London Mint has a very complete electric light and power installation. See Electrical Review, July 10th, 1908.

Educational Notes.—University of London.—The annual report on the work of University College, London, has just been issued. The total number of students during the session 1907-8 was 1,361, being an increase of 170 on that of the preceding session. Grateful acknowledgment is made for various benefactions, including a gift by the Past Engineering Students' Committee of £410 for the new equipment of the engineering departments. The rearrangement and re-equipment of the College buildings, resulting from the acquisition of the south wing for University purposes, is steadily progressing. During the year a large number of public lectures and courses of lectures have been organised, which have been attended by over 3,000 persons. Among the most noteworthy was Prof. Fleming's course on "The Scientific Principles of Wireless Telegraphy." The organisation of the arrangements for post-graduate courses and for research has been improved, with a result that the number of post-graduate and research students has increased from 171 to 239. The accessions to the libraries have been 3,550 volumes. The report closes with a summary of the urgent needs of the College. The need for new buildings for the Department of Chemistry at a cost of about £70,000 is placed in the forefront.

University of Leeds.—The Report for 1907-8 has come to hand, and contains an account of the Royal visit in July last. Large extensions have been carried out, including a new Electrical Engineering Building, and the report shows very satisfactory growth in the receipts and the number of students in attendance.

Institution and Lecture Notes.—Society of Engineers.—A new test for concrete was described by Mr. J. S. Owens, on Monday last. The principle on which the author's test is based was thus explained:—"If we take a few small samples from different parts of the heap of concrete, and if we can tell in some simple way whether all the samples contain the same relative proportions of stone, sand and cement, we have a means of telling whether the concrete is properly mixed or not." The author's method of comparing the samples is simply to place each in a tall glass cylinder nearly filled with water, shake them up and allow them to settle. The rate of settlement of the cement in water was shown to be about 30 times as slow as that of the sand, which, in turn, was slower than that of the larger particles of stone; this caused the stones, sand, and cement to settle on the bottom in distinct layers. It was shown that the depth of these layers was proportional to the amount of the material present in the sample, and that in this way it was possible to tell whether each sample had the same amount of cement, sand, and stone. The author concluded by expressing the hope that the test would be of value in enabling engineers to determine whether their concrete was being properly mixed or not; and, in relation to mixing machines, in fixing the time necessary with any machine to mix properly, and thus to determine its legitimate output.

Association of Engineers and Shipbuilders.—Mr. J. A. Robertson, M.I.E.E., the burgh electrical engineer of Greenock, recently lectured on the subject of "Electricity in Modern Industry."

Royal Society.—Among the papers down for reading yesterday afternoon was one by Dr. A. D. Waller, F.R.S., on "The Effect of Heat upon the Electrical State of Living Tissues."

Liverpool and District Electrical Association.—On Saturday afternoon, February 27th, the members of the above Association paid a visit to the Instrument Rooms at the General Post Office, Liverpool, by the courtesy of Mr. F. Salisbury. An inspection was also made of the Trunk Telephone Exchange. At last Tuesday's meeting the subject of "Motor Starters for Direct Current" was further considered. The question was again introduced by Mr. J. Greenhalgh, of Birkenhead, and there was much discussion on various points. Interest was shown in a model friction clutch, kindly lent for the occasion by Messrs. D. Bridge and Co., of Castleton, and also in a pair of motor-starters lent by Messrs. Veritys. The next meeting takes place on Tuesday, March 16th, when a paper by Mr. W. H. Fennell, of Birkenhead, on "Arc Lamps," will be read.

International Electrotechnical Commission.—At the Council meeting of the International Electrotechnical Commission in October last, the question of an international unit of light was brought forward by the French Electrotechnical Committee. The proposition of the French delegates was, however, adjourned in order that the Electrotechnical Committees in the different countries might have an opportunity of further studying the subject. The Council also recommended that the Committee in each country should endeavour to arrange matters in such a way as to satisfy the needs of both the gas and the electrical industries. Considerable progress has been made here, and the British Committee has now appointed a sub-committee under the chairmanship of Dr. R. T. Glazebrook, F.R.S., to go fully into the details of the question. Dr. Glazebrook will be assisted by Dr. S. P. Thompson, F.R.S. (British Delegate to the Commission), Prof. C. V. Boys, F.R.S., as official representative of the "Gas Referees," and Mr. J. W. Helps, M.Inst.C.E., officially nominated by the Institution of Gas Engineers.

With the cordial co-operation of the gas industry thus obtained, it is hoped that the sub-Committee may be in a position to report at no distant date, especially in view of the experiments lately carried out at the National Physical Laboratory, which point to the probability of an eminently satisfactory solution.

Fire-Proof Equipment in the Washington Street Tunnel, Boston.—The new Washington Street tunnel in Boston, which was opened November 30th to public traffic, illustrates in its design and equipment the extreme tendency toward fire-proof construction which characterises the latest practice in the building of underground rapid transit routes. The tunnel has been built by the Boston Transit Commission, and leased by the Boston Elevated Railway Co. for a period of 25 years. From portal to portal it is 5,676 ft. in length, and its total cost, including approaches and equipment, is estimated at about £2,000,000. It will increase the traffic capacity of the Boston Elevated system through the heart of the business centre by about 175 per cent.

Throughout the tunnel the steel construction has been protected by concrete from rust and fire. The doors, ticket offices and escalator balustrades are encased in sheet bronze; telephone booths, package rooms and electricians' cupboards are constructed of masonry, and even the signs are of metal. The platforms are all about 350 ft. long, to accommodate eight-car trains, although five or six-car trains will be run at first, pending the final lengthening of the elevated railway platforms from their initial capacity of five cars each per track.

The ticket offices in the tunnel are built of sheet-copper. Guards in front of ticket sellers' windows are of bronze, and the railings at the choppers' stands are of heavy brass pipe. Wherever doors occur in the tunnel they are covered with sheet-bronze and are panelled in a simple way. Smaller signs used in the tunnel are in general of enamelled iron agreeing in design with the colour scheme of the particular station. News counters are built with concrete walls, faced with glazed tile. The platforms are of finished granolithic surface with edges conspicuous through the use of white porcelain cement.

At the State Street station five escalators will be in service. The balustrades of these escalators are covered with sheet bronze, and the walls that separate them from the adjoining staircases are faced with tile. The station lighting is provided by incandescent lamps arranged in general out of the direct line of vision of those on the platforms. To ensure against cutting off the current and throwing the stations into darkness at any time, three sources of supply are provided, including a connection with the Edison Electric Illuminating Co., of Boston. Each source is independent of the others, and is installed to cut into service automatically in case an interruption of the supply occurs. The East Boston Tunnel is provided with a somewhat similar arrangement.

For the pumping equipment of the tunnel three chambers are provided, each having two motor-driven pumps. One pump has a capacity of 100, and the other a capacity of 1,000 gallons per minute. The smaller pump is designed to handle all the normal water flow, while the larger pump is provided to take care of emergency flows, such as might occur during the bursting and rupture of a large main outside or adjacent to the tunnel. These pumps are arranged to start automatically in case the water rises in the drainage wells, and if the work is an overload for the smaller pump, the larger one will automatically go into service. Ventilation is provided by four fan chambers, each containing two fans capable of exhausting 25,000 ft. per minute each when operating at full load. Foul air is to be discharged through concrete ducts leading to the upper air.

Annual Supper.—The annual supper of the employés of the Merthyr Electric Traction and Lighting Co., Ltd., was held at the Tiger Hotel, Pontmorlais, on Friday evening, February 19th. Mr. Lewis W. Dixon, managing engineer, was in the chair, supported by Dr. W. W. Jones, medical officer to the company, Mr. A. J. Howard, chief assistant engineer, Mr. A. B Cousins, assistant engineer, and Mr. H. King, traffic superintendent. Dr. W. W. Jones proposed "Success to the Company," and Mr. Dixon, responding on behalf on the company, said that after years of struggle the Merthyr Co. was beginning to do better, and he thanked the staff for their loyal support and complimented them upon their work. Inspector A. Gwyn was presented with a sewing machine, together with a pipe in case, on behalf of the staff on the occasion of his marriage. A musical programme arranged by Mr. E. Rowlands was then gone through.

Malta.—The letter on the subject of "Malta," published in our issue of the 19th ult., levelled mysterious allegations against the inhabitants of that island, and the reply which appeared in the following issue shed little light upon the matter. The true explanation has now come to hand, and we are pleased to say that the aspersions cast upon the Maltese character were unfounded; the unpleasant practices ascribed to the islanders existed only in the imagination of our correspondent, who, we understand, is suffering from a distressing illness.

Parliamentary.—Wireless Telegraphy.—Mr. Field asked the President of the Board of Trade whether he would take into consideration the advisability of introducing a Bill to have wireless telegraphy provided on all passenger vessels, and as far as possible on all classes of ships, and Mr. Churchill stated in the Parliamentary Papers that the question whether legislation was necessary on the subject would be considered.

North Metropolitan Electric Power Bill.—A Select Committee, consisting of Mr. Partington (Chairman), Major Coates, Mr. F. Meeham and Mr. A King, has been appointed to consider the above Bill on March 11th.

(*Continued on page* 393.)

THE JHELUM RIVER POWER DEVELOPMENT.

By WILLIAM T. TAYLOR, M.I.E.E.

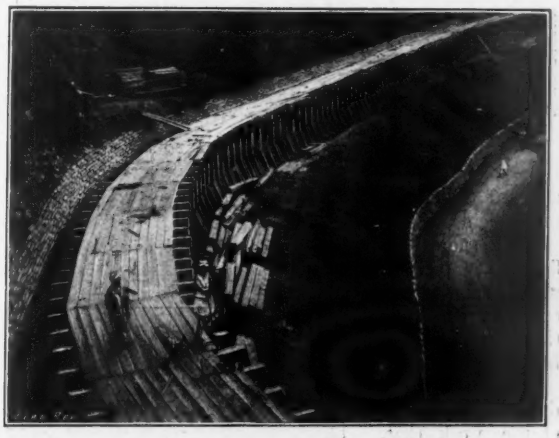
Kashmir is the beautiful elevated and enclosed valley in the Himalaya Mountains, of which Mohammedan writers have painted such rapturous pictures, and from which Moore has drawn material for some of his famous writings. The valley lies north of the Punjab, in the northernmost part of British India. It is surrounded by lofty hills with one opening on the west, and the Jhelum River, after wending its way across the plateau, discharges through this opening to the west and south.

The lowest part of the valley is a mile above the sea, and its mean height 6,000 ft.

The river Jhelum flows north-west through the middle of the Kashmir Valley ; after a slow and winding course, it expands about 25 miles below Srinagar, India. It is in this gorge, about 50 miles below Srinagar, that the Jhelum water-power plant has been built.

The site of the head works was located about 6½ miles above the forebay and power house, at Mohora, the available working head being approximately 400 ft.

The present works, in so far as they relate to the development of water power, have been constructed of capacity 20,000 H.P. at Mohora, of which but 5,300 H.P. will for the present be utilised, the generating plant comprising four units only, each of 1,000 KW.



View showing Timber Flume Construction.

The Pipe Lines Under Construction.

Portion of Flume Constructed in Masonry.

The head works consist of a draft or intake channel, regulating basin, and scour sluice, the latter having four vents, each 4 ft. × 7 ft. Of main sluices there are 10, in two tiers, one above the other, for use at high and low-river level. These discharge into a small regulating basin giving admittance to the supply channel. The gates are all of steel, and provided with suitable screw-gearing for manipulation. All vents are protected by heavy iron gratings, and a vertical grid barrier of old rails erected vertically across the intake channel, together with massive floating timber booms, securely anchored, afford further protection from damage by passing timber, vast quantities of which are floated down the river each flood season.

The capacity of the main sluices is over 600 cb. ft. per second, with minimum head available at low water.

The total length of the supply channel is 6½ miles, made up as under :—

	Miles.
Masonry-lined duct	1·57
Silt basin	0·11
Timber flume ...	4·67
Rock tunnel, unlined	0·15
Total length ...	6·50

Masonry lining was inevitable owing to the nature of the soil — loose shingle, boulders and silt, in irregular formation. The thickness of masonry lining averages 2 ft., with back filling of clay concrete ; that of the floor 6 in., sub-laid with concrete of 6 in. minimum thickness. The supply channel has a uniform grade of 1·05 per 1,000 from the head works to the forebay.

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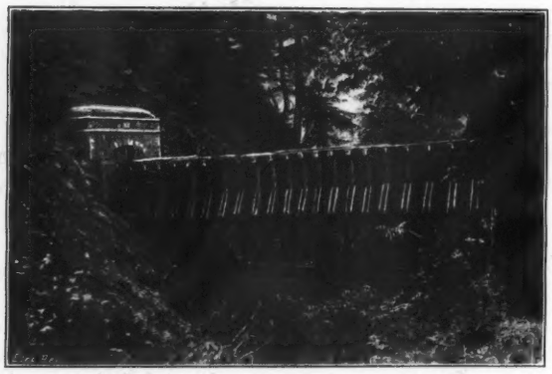
There are six tunnels on the line, of an aggregate length of approximately 2,000 ft., and the timber flume is carried

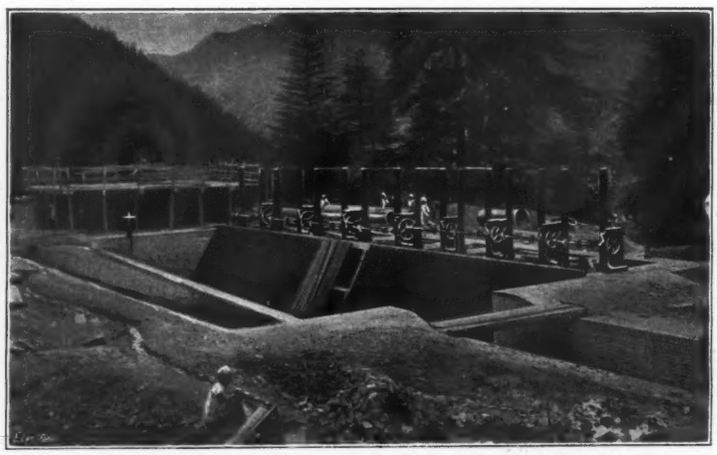


Steel Bridge Carrying Flume Across Ravine.

through several of them; there are also five large acqueducts over gorges, &c.

Three snow sheds have been constructed over the timber flume at points where snow drifts are known to be at times exceptionally heavy.

It was found during the progress of the work that, during periods of abnormal rainfall, very heavy trees and drift timber, &c., as well as boulders, were apt to be swept down two ravines, the flow of water in which was ordinarily quite insignificant. The means adopted to avoid trouble in these cases took the form of very heavy timber floors, or aprons, laid over the flume, of which they are independent, and supported by substantial cribwork abutments of logs and stone.



The Forebay During Construction.

For the construction of the timber flume a timber working plant was imported, and installed with two portable engines in a temporary mill at Rampur, where the whole of the tongued and grooved planking, &c., for floor and side lining (over one million lineal feet), together with a quantity of other miscellaneous work, was dealt with. The rectangular flume frames were all worked up by hand on the site.

The flume has been necessarily roofed throughout, to exclude soil, &c., from the hillsides above.

The capacity of the flume is well over 500 cb. ft. per sec. at full depth of flow (8 ft.), and with a velocity slightly in excess of 8 ft. per sec. This is equivalent to over 18,000 H.P. at the power house, Mohora.

The forebay is constructed so that the water passes over the spill way into a waste duct extending around the mountain side to a "nullah."

The penstock pipes are of welded steel, 36 in. to 30 in. diameter and $\frac{3}{16}$ in. to $\frac{5}{16}$ in. thick, for upper and lower portions respectively of the pipe lines, which are 750 ft. in length.

The pipes, where above ground level, are supported by brickwork piers, at 20 ft. centres, measured on the slope.

The power house building is 183 ft. 6 in. long, and 76 ft. wide at main floor level.

In it, additional tail-races for four more machines of similar capacity to those now installed, together with six extra transformer compartments, have been provided.

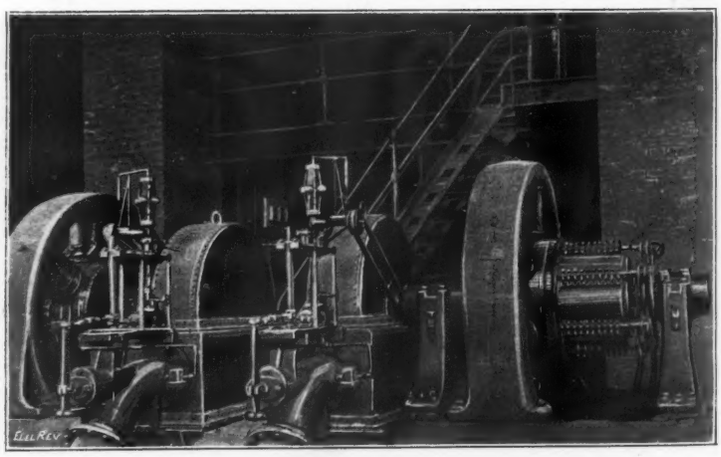
A spacious machine shop has been provided at the east end of the power station; this building also contains a complete oil-treating plant, and a specially constructed pit to facilitate work upon the main transformers.

The plant may be considered as being divided into four parts, namely:—(1) The transformer and generator room; (2) switchboard, L.T. switch and L.T. bus compartments; (3) H.T. switch, lightning arrester and H.T. bus compartments; (4) water supply chamber for transformers. These compartments are divided from each other by brick walls, which also form the support for the floor of the oil-switch room above, which contains the H.T. and L.T. remote-control oil switches, the L.T. being for 2,300 volts. The walls and floor of the oil-switch room are constructed of concrete.

At the present time four water-wheel units with automatic oil-pressure governors are working, each guaranteed to deliver 1,765 B.H.P. to the shaft under an effective head of 400 ft.; speed, 500 R.P.M. The needle regulating nozzle is controlled by hand, and provided with a jet deflector to be operated by an automatic governor to take care of the sudden load fluctuations.

The nozzle is of the duplex type, two jets being provided for each wheel.

The speed regulation of the water wheels is effected by a governor, which deflects the jets of the two nozzles. The needles are usually set to the maximum size of jet, which will be sufficient to develop the maximum peak load expected for that period of setting on the needles.



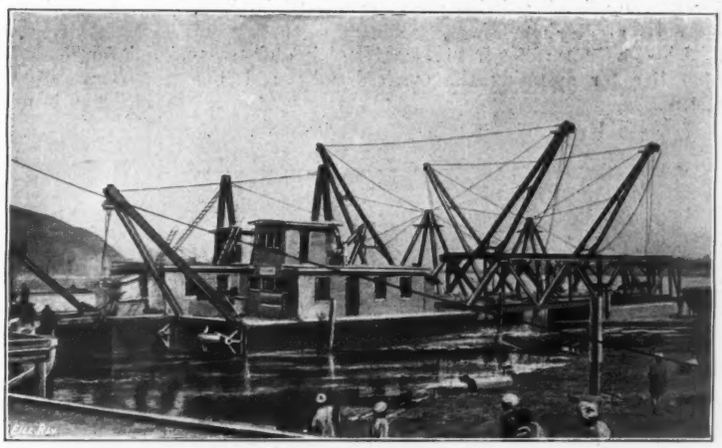
Two Exciter Units in the Power Station.

At the upper end of the tail race, where the jet discharges almost perpendicularly downwards, flat steel plates were set in the concrete foundation; the wheel races were also lined with plate steel on both sides.

At full gate the guaranteed wheel efficiency is 77 per cent.

Below the switchboard gallery are located two exciter units, each unit consists of a 150-KW., 125-volt generator, and of ample capacity for the four generators. Between the transformer compartments is located a 35-KW. exciter driven by an impulse wheel. Coupled directly to the other end of the water wheel shaft is a 50-H.P. induction motor, which is connected directly to the 2,300-volt bus-bars of the station. The water wheel of the exciter is run with its valve open as for full load at all times. When less than full load is on the exciter, the induction motor runs as a generator, delivering energy to the main bus-bars. If the action of the water wheel for any cause is interrupted, the induction motor drives the exciter in the ordinary way.

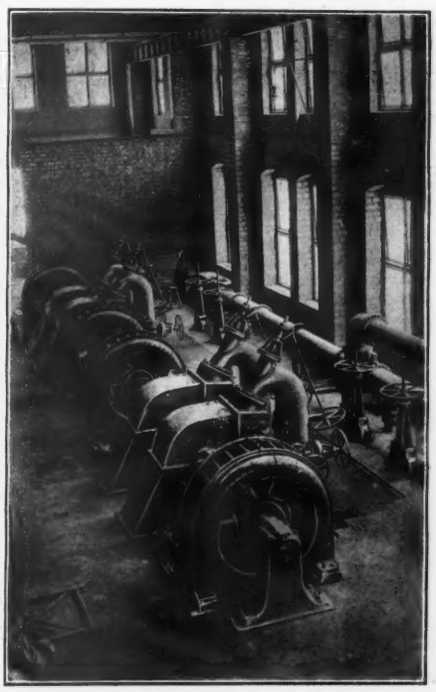
The generators are rated at 1,000 KW. each, three-phase, 25 cycles, and are wound for 2,300, 4,600 and 6,312 volts, and delta connected for 2,300 volts for the present. They are of the revolving field type. The regulation at full load and unity power factor is 6·95 per cent.; the efficiency is 96·12 per cent. at full load.



ELECTRICALLY-OPERATED DREDGES ON THE JHELUM RIVER.

In the transformer room there are six 1,000-KW. transformers, arranged in two banks of three each. The transformer ratio is 2,300 to 60,000; they are connected in "delta" on both low and high-tension sides. The transformers are oil-insulated, water-cooled, and each tank contains 1,430 gallons of oil. The commercial efficiency of the transformers at full load is 98·36 per cent.

ONE OF THE BUCKET WHEELS FOR THE POWER HOUSE PRIME MOVERS.



INTERIOR OF THE POWER HOUSE, MOHORA.

Each transformer is mounted on wheels, and can be moved out of the compartment so that it can be taken apart with the aid of the overhead travelling crane.

The leads from the transformers are connected to remote-control oil-switches on the L.T. side, and similar type switches on the H.T. side, a reverse-current instantaneous relay protecting both sides through series transformers connected between transformer windings and switches.

The H.T. leads from the step-up transformers pass through the brick wall of the compartments, and thence up to the oil-switches. The leads are of bare wire mounted on porcelain insulators.

The switchboard is a duplicate to the one at Necaxa (ELECTRICAL REVIEW, September 4th, 1908), of the benchboard type, and is located on a gallery about the middle of the main generator room, where the operator can readily observe everything happening on the generator floor. The controlling wires to the motor-operated oil-switches, which switches are located in a gallery comprising the second floor of the transformer house, are run in 1¼-in. enamelled-iron conduit, as are also the generator and exciter field circuit leads. The control apparatus consists of the following:—

(*a*) Generator control benchboard.
(*b*) Generator instrument board, directly connected to the benchboard.
(*c*) Exciter control switchboard.
(*d*) Transformer control benchboard.
(*e*) Transmission-line control benchboard.
(*f*) Tirrill regulator and station lighting switchboard.

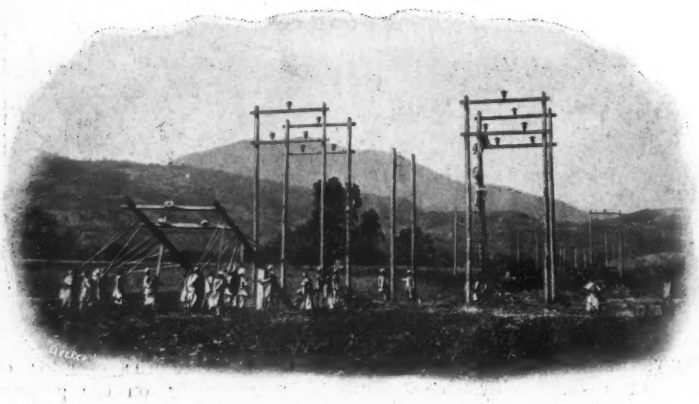
The benchboard accommodates four sets of operating handles for the generator main switches, four sets for the transformers, two sets for the 60,000 and 2,300-volt bus-bars, and two sets for the transmission line, all on one side of the benchboard.

The generator field switchboard is located below the main switchboard. The field rheostats are controlled by small motors operated by means of small single-pole double-throw switches, which are closed in an upward or downward position, depending upon the desired direction of rotation of the switch arm. For the exciter field circuit there is a similar arrangement, but operated by solenoids. The solenoids of the switch, mounted with the rheostat, have a common plunger, which acts on the switch arm, and so long as the small single-pole double-throw switches remain closed the solenoid is energised, and a continuous step-by-step rotation given. The electrically-operated rheostat has

proved very satisfactory, and perfect adjustment of the resistance can be obtained.

The L.T. oil-switch cells and bus-bars are located on the same floor as the switchboard. The generator switches are three-phase, solenoid operated, all the others are motor operated.

The 60,000-volt oil switches are automatic triple-phase, the oil pots for each phase being placed in a separate fireproof cell. Three series transformers are connected in each transmission line for operating the overload relay and line ammeters.



Transmission Line During Construction.

The lightning arresters are of multiplex type, one set on each of the two transmission lines. The circuits are equipped with choke coils (consisting of 20 turns of hard-drawn copper) to protect the transformers from damage due to surges. The leads, after passing the choke coils and taps for the lightning arresters, pass out of the building through 60,000-volt wall bushings.

There are two independent three-phase transmission lines to Baramulla; and two sub-stations there provide means by which the apparatus can be connected to either or both of the lines.

The standard size of pole is 35 ft. long with 8-in. dia. top. The insulators, which are 14 in. in dia., are four-part in porcelain, and after being cemented together were tested at 120,000 volts for ten minutes.

The transmission line conductors are made up of six No. 8 copper wires, with jute centre, they are located at a centre of an equilateral triangle, the sides of which are 6 ft. The standard spacing of the poles is 175 ft. At angles in the line truss poles were used, and where the angle was quite sharp a group of poles was used with extra cross arms and transmission wires carried around the insulators. At crossings an earthed cradle was employed.

The transmission lines cross the river Jhelum five times within five miles of the power house. At each crossing terminal towers are set up on both sides of the river. For about 20 miles the transmission lines run through a rugged country exposed to severe south-westerly winds and covered for days with snow.

The transmission wires are transposed (120 degrees) three times throughout the length of line.

There are at the present time seven linemen whose duty it is to patrol the line daily. They reside at patrol houses, and each man inspects about seven miles of line, which is the distance from one patrol house to another, returning over the same line the same day.

A metallic circuit telephone line carried below the 60,000-volt wires, is run from the power house and connects with No. 1 and No. 2 sub-stations at Baramulla, Srinagar sub-station, and the patrol men's houses.

The telephone line is transposed (180°) at every pole structure. Each telephone instrument is protected with a telephone transformer, long fuses and a grounding device.

Between the head works, forebay and power house is a local telephone system, entirely independent of, and separate from, the telephone circuits carried on the transmission line poles.

Baramulla Sub-stations and Dredging Fleet.—The dredging fleet is used in deepening the river Jhelum from the Woolar Lake to four miles below Baramulla. The nature of the soil to be dredged is clay, boulders and sand, the approximate amount being 5,700,000 cb. yd. In the case of the clay and sand two hydraulic dredges are employed, and for the boulders and big gravel a dipper dredge.

From the hydraulic dredges the spoil is deposited through a floating pipe over the embankments which border either side of the river. The lift of pipe above the surface level of water in the river is above 20 ft.

The deposit of spoil from the dipper dredge is arranged by using large scows, which are floated near the bank of the river, where the travelling derricks are located. There are two clam-shell derricks; these remove the spoil from the scows, raise it, and deposit it behind the derricks on the bank. The radius of these derricks are 75 ft., enabling the spoil to be deposited at a good distance from the bank of the river.

For supplying the dredgers there are two 60,000-volt floating sub-stations.

The floor and sides, 6 ft. 6 in. high, are lined with brick, so as to make them fire-proof, and above this point the superstructure is built of corrugated iron with a wooden frame.

The incoming lines enter through wall bushings, drop down through choke coils, and branch off through six combined expulsion fuses and disconnecting switches to two banks of transformers. These expulsion fuses are so arranged that they serve also as disconnecting switches; their rating is 100 amperes, 60,000 volts. Above the choke coils connections pass across under the roof from the incoming lines to the 60,000-volt lightning arresters, which with their disconnecting switches are situated on the opposite wall.

View showing Method of Erecting Transmission Line Poles.

There are six oil-insulated transformers, each having a rated capacity of 200 KW., and arranged in two banks of three each. The transformer ratios are 57,500 volts with taps for 27,500, 55,000, 23,750, 47,500 volts down to 2,300, with reduced capacity taps for 2,200 and 2,100 volts. They are connected in "delta" on primary and secondary.

(To be concluded.)

NOTES.

(*Continued from page* 388).

The Ideal Insulator.—"Megohm" writes:—"There is room for an insulating material to be used for switchgear and joint boxes, with the following points:—(1) Must not absorb moisture; (2) suitable for tooling; (3) fire resisting; (4) mechanically strong; (5) good insulation resistance.

"So far as I know, ebonite is the only material that will suit, and this is affected by heat, and is also expensive.

"If any of your readers can recommend such a material, it will doubtless be of use to others besides myself."

It would, indeed!

Cricket Club Dinner.—The annual dinner of the Chelsea Electric Supply Co.'s Cricket Club was held on Tuesday, February 23rd, at the Pier Hotel, Oakley Street, Chelsea, with Major Fountain Woods in the chair. A large company sat down, and were afterwards entertained by an excellent programme. As the company was assembled for pleasure, the speeches were cut down to a minimum. The most remarkable of the evening was that given by Mr. Mallett, a patron of the club. He lectured the cricketers on the need for cultivating the art of fielding. The proceedings during the evening seemed to emphasise the cordial spirit of mutual confidence and co-operation existing between the staff of the Chelsea Electric Light Co. and the directors and chiefs.

Electric Steel.—Plant for the electrical production of steel has just been put down at the works of the Cockerill Co., at Seraing, near Liége, Belgium.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

Central Station Officials.—The Croydon T.C. has increased the salary of Mr. E. A. Fella, mains superintendent, from £190 per annum to a maximum of £230, by annual increments of £10.

Mr. William Hartley, the electrical mains superintendent for the Nelson Corporation, has been appointed chief assistant mains superintendent to the Rochdale Corporation.

Tramway Officials.—The Haslingden Town Council has appointed Mr. Barnes Kay as managing inspector of the tramways and motor-'bus inspector.

The Tramways Committee of the Brighton T.C. has recommended that Mr. Brooks, chief inspector, be appointed traffic manager at a salary of £2 5s. per week.

The Ilford U.D.C. has appointed Mr. W. H. Simpson, of Colchester, as works foreman of the tramway department.

The Chester T.C. has increased the salary of Mr. Gardner, tramways manager, from £250 to £270 per annum.

The L.C.C. has been recommended to increase the salaries of 31 officials out of a total administrative permanent staff of 78 officials. In the majority of the cases the increase is recommended on the general grounds of added duties and responsibility due to increased work resulting from the adoption of electric traction on further portions of the Council's tramways. The principal alterations are:—Mr. J. K. Bruce, traffic manager, advanced from £850 to £1,000 per annum by three annual increments of £50; Mr. J. Welling, permanent-way engineer, from £500 to £550; Mr. H. D. Smith, advertising assistant, from £500 to £525; Mr. W. E. Ireland, rolling stock superintendent (1,100 cars, an increase of 189 since his appointment), from £400 to £450; Mr. W. Craufurd, assistant permanent-way engineer (southern section), is to be advanced from £250 to £275; and Mr. E. T. Holt, acting in a similar capacity for the northern section, from £243 to £275.

General.—In the list of 15 candidates who have been selected by the Council of the Royal Society to be recommended for election, we observe the name of Sir Robert Abbott Hadfield.

Mr. J. D. Nettleton was presented on Thursday, February 25th, with a smoker's cabinet, suitably inscribed, by the staff of the Bury Corporation Electricity Works on leaving to join the Manchester branch of Messrs. Siemens Bros.

NEW COMPANIES REGISTERED.

Electrical Contracts and Maintenance Co., Ltd. (101,757).—This company was registered on February 26th, with a capital of £3,000 in £1 shares, to adopt two agreements, the parties to which are not named, and to carry on the business of manufacturers of and dealers in apparatus and inventions connected with the production, storage, transmission or use of electricity or electric power as applied to lighting, telephones, telegraphs, fire alarms and other means of electric communication, &c. The subscribers (with one share each) are:—J. J. L. Newland, The Red House, Byfleet, engineer; F. A. Fraser, Elmfield, Crowstone Road, Westcliff-on-Sea, engineer. Private company. Table "A" mainly applies. Registered by Waterhouse & Co., 56, Cornhill, E.C.

Hurst, Nelson & Co., Ltd. (7,028).—This company was registered in Edinburgh on February 16th, with a capital of £320,000 in £10 shares, to purchase the business of Hurst, Nelson & Co., Ltd., railway wagon builders and makers of railway plant, at Glasgow, Motherwell and elsewhere, and to carry on the business of builders, makers and repairers of and dealers in railway, tramway and road rolling stock and permanent way materials and plant, motor vehicles, railway, electric, gas and tramway locomotives, iron masters, bridge and roof builders, engineers, &c. The subscribers are:—J. T. Tullis, St. Ann's Works, Glasgow, leather merchant, 100 shares; T. Mason, Polmadie, Glasgow, contractor, 100 shares; T. Jackson, 24, George Square, Glasgow, chartered accountant, 100 shares; A. M. Grahame, Glenny, Port of Monteith, gentleman, 100 shares; A. S. Nelson, Motherwell, railway carriage builder, 100 shares; J. Mackenzie, 150, St. Vincent Street, Glasgow, writer, 50 shares; J. G. Weddell, 40, W. Nile Street, Glasgow, chartered secretary, 50 shares. The number of directors is not to be less than three or more than six; the first are J. T. Tullis, T. Jackson, T. Mason, A. M. Grahame and A. S. Nelson; qualification, 100 shares; remuneration, £1,100 per annum, divisible. Registered office, The Glasgow Rolling Stock and Plant Works, Motherwell.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Rolling Stock Corporation, Ltd. (79,941).—A memorandum of satisfaction, to the extent of £8,800 of 7 per cent. debentures, dated February 8th, 1904, securing £100,000, has been filed.

Gosport and Alverstoke Electric Lighting Co., Ltd. (82,693).—This company's annual return was filed on December 31st, when the entire capital of £5,000 in £10 shares had been taken up and paid in full. Mortgages and charges: Nil.

Northampton Electric Light and Power Co., Ltd. (28,640).—Issue on February 17th, 1909, of £500 debentures, part of series created June 3rd, 1893, to secure not more than two-thirds of the amount of the subscribed and paid-up capital, charged on the company's undertaking and property, present and future, including uncalled capital. No trustees.

Julius Sax & Co., Ltd. (63,371).—Issue on February 15th of £1,000 debentures, part of series created October 23rd, 1908, to secure £2,500, charged on the undertaking and property, present and future. No trustees.

Bi-Centric Insulating Co., Ltd.—Particulars of £200 second debentures created January 29th, 1909, filed pursuant to Sec. 10 (3) of the Companies' Act, 1907, the whole amount being issued on February 1st. Property charged: Undertaking and general assets. No trustees.

Unity Motor, Electrical and General Engineering Co., Ltd. (97,911).—Issue on February 6th of £675 debentures, part of a series created July 4th, 1908, to secure £1,000, charged on the company's undertaking and property, present and future, including uncalled capital. No trustees. Previously issued of same series: £325.

New Ignition Syndicate, Ltd. (91,175).—Issue on February 19th of £1,000 debentures, part of series created November 19th, 1908, to secure £5,000, charged on the company's undertaking and property, present and future, including uncalled capital. No trustees. Total amount previously issued of same series: £2,000.

CITY NOTES.

Newcastle and District Electric Lighting Co., Ltd.

The directors' report for 1908 says that the number of units sold was 9,182,095, as against 9,282,370 sold in 1907, being a decrease of 1·08 per cent. for the year. This is the first year since the commencement of the business that there has been any decrease when compared with the previous year; the decrease is largely due to the depression in trade, protracted strikes, and the more general use of metal-filament lamps. There was a considerable falling off in the energy used by old consumers, but this has been nearly compensated for by new consumers, with the result that the gross profit is practically the same, and although the metal-filament lamps give more light for a lessened amount of energy used, it is anticipated the result will ultimately be a large addition to the number of customers. The gross profit for the year for Newcastle amounts to £18,737, and for Newburn to £346, which, together with the sum of £5 received for transfer fees, makes the total £19,087. After deducting directors' and trustees' fees, income-tax, &c., and making provision for leasehold redemption fund, there remains a balance of £17,864. After providing for interest on debenture stock, temporary loans, &c., there is a balance of £6,705, out of which the directors recommend a dividend at the rate of 2 per cent. per annum for the year ended December 31st last (less income-tax), absorbing £5,600, and carrying forward £1,104. The arrangement made with Messrs. John Spencer and Sons, Ltd., to utilise their exhaust steam has now come into force, and the plant is working satisfactorily. The horse-power in motors connected in Newburn at December 31st last was about 2,000, and the existing machinery is sufficient to cope with the large additional demand which our consumers have in contemplation. The slackness in the steel trade has seriously affected this station, and the profits have not realised what was expected. The directors, however, feel that with an improvement in trade, more satisfactory results will be obtained. The estimated capital expenditure for 1909 is very small, and expenditure will only be made where an immediate and adequate return will result. In regard to the Benwell and Fenham area, the provisional order for which was obtained by the Corporation, a satisfactory arrangement to give a supply of electricity within the most compact part of Fenham has now been made, and a large number of consumers have been connected to the mains. The whole of the plant and machinery has been maintained in a high state of efficiency out of revenue during the year. The directors very much regret the death of Mr. John W. Spencer, who had been a director for the last five years. Sir Charles S. Milburn, Bart., has been elected a member of the board.

Telegraph Construction and Maintenance Co., Ltd.

The forty-fifth ordinary general meeting was held on Tuesday at the offices, 38, Old Broad Street, Sir James Pender, Bart., presiding.

The Chairman, in proposing the adoption of the report (see Electrical Review, February 26th, page 351), said he hoped the shareholders would agree with the board in thinking it was not a bad one, when they remembered the general depression in trade that had prevailed during the past year. The net profit for 1908 amounted in round figures to £61,895 after charging interest on debentures. To that sum £109,445, brought forward from the previous year, had to be added, making £171,340, and after deducting the interim dividend of 5 per cent. paid last July, there remained £148,938 to be dealt with. Of that sum the directors proposed to distribute a dividend of £1 4s. per share, making, with the amount already paid, a total dividend for the year of £1 16s. per share, or 15 per cent., leaving £104,110 to be carried forward. Their property had rather increased since last year, due to their building a new ship, which was already partly paid for, and also to their stock of materials being rather heavier than it was at the end of the previous year. On the whole, if the results were not quite so good as they were able to show in the previous year, which was an exceedingly active and successful one, they were very much the same as the year before last. They had been able to hold their own, and were in almost exactly the same position as they were at the end of 1906, which was described at that time as a strong position, and one upon which they might well congratulate themselves, so he hoped the report would meet with their approval. The great industry of submarine cable manufacture, which had its birth at their factories, had gone on until their red lines had stretched out to all parts of the world, and their output in round figures totalled 200,000 miles. There was still plenty of work going on, but unfortunately not so much of it was the result of British enterprise. At one time it seemed as if the whole of the work of the world's communication was destined to be in British hands, but now other countries had become alive to the importance of submarine telegraphy, and they were extending support and financial assistance to new cable projects, while in this country the credit and enterprise of the existing cable companies were being injuriously affected by threats of unremunerative rates and State competition, so it was a fact not to be surprised at that of late years the company as contractors had found more and more of their work being executed to the order of foreign countries.

Mr. Colin F. Campbell seconded the motion.

Replying to a Shareholder, the Chairman said that as to wireless telegraphy, he did not think he could say anything more than shareholders already knew. The latest boom, he thought, had been owing to the very successful saving of life in the Atlantic, and that had made people think about the system. They all appreciated the virtues of wireless telegraphy, and he admitted that it had many virtues, but at present they did not see anything in it that would interfere with them.

The report was then adopted.

Companies Struck Off the Register.—The following companies have been struck off the register, and are accordingly dissolved:—

Aluminium Soldering Co., Ltd.
British West African Rubber Concessions Syndicate, Ltd.
Electric Light and Power Co. of Japan, Ltd.
Electric Motive Power Co., Ltd.
Electro-Carbide Lamp Syndicate, Ltd.
Epstein Electric Accumulator Syndicate, Ltd.
Henry F. Joel & Co., and Thomas Potter & Sons United, Ltd.
International Power Co., Ltd.
London Electro-Mobile Syndicate, Ltd.
Ozonic Ventilating Co., Ltd.
Tramway Share and Debenture Corporation, Ltd.
Welsh Electric Traction Co., Ltd.

Huelva Gas and Electricity Co., Ltd.—The report for 1908 states that the net profit for the year amounts to £3,193, to which has been added the balance brought forward £576, making £3,769. The directors recommend a dividend of 4 per cent., free of income-tax, writing off against property and assets £1,000, transferring to reserve account £1,000, and carrying forward £769. The capital outlay during the year upon the electric extension was £12,657. The new electric plant is now in operation, and the company is supplying power and lighting to the Harbour Board, but owing to the pier not having been in constant use, full benefit has not yet been obtained.

City of Carlisle Electric Tramways Co., Ltd.—The directors' report for the year ended December 31st, 1908, states that the revenue account shows a surplus of £1,438, being a decrease of £347, as compared with last year; and the balance of profit and loss account, after providing for debenture stock interest and debenture stock trustees' remuneration, is £335, which is to be carried forward. The car-miles run in the period have been 353,012, the number of passengers carried 2,600,210, and the total receipts amounted to £9,618, being an increase of 2,308 miles run and 48,879 passengers carried, and a decrease of £124 in receipts respectively. Owing to the increase in maintenance and repairs the working expenses are £223 in excess of last year.

Davis & Timmins, Ltd.—For 1908 the directors recommend a dividend on the ordinary shares at the rate of 8 per cent. per annum. This is the same rate as for 1907.

Stock Exchange Notices.—Applications have been made to the Committee to allow the following securities to be quoted in the Official List:—

Adelaide Electric Supply Co., Ltd.—Further issue of 6 per cent. cumulative preference shares of £5 each, fully paid.
British Columbia Electric Railway Co., Ltd.—Further issue of £100,000 5 per cent. cumulative perpetual preference stock.
Lisbon Electric Tramways, Ltd.—Further issue of 39,838 ordinary shares of £1 each, fully paid.
Mansfield and District Tramways, Ltd.—60,000 6 per cent. cumulative preference shares of £1 each, fully paid; and £70,000 4½ per cent. mortgage debenture stock.

The Committee has ordered the undermentioned securities to be quoted in the Official List:—

British Westinghouse Electric and Manufacturing Co., Ltd.—£250,000 6 per cent. prior lien debentures of £100 each, Nos. 1 to 2,500, in lieu of the scrip now quoted.
Malacca Rubber Plantations, Ltd.—185,000 ordinary shares of £1 each, fully paid, Nos. 115,001 to 300,000.
Vickers, Sons & Maxim, Ltd.—Further issue of 50,000 ordinary shares of £1 each, fully paid, Nos. 3,500,001 to 3,533,714 and 3,673,215 to 3,689,500.

Richardsons, Westgarth & Co., Ltd.—The directors report that the year's working has been unsatisfactory, due to the practical cessation of work for the strike period of seven months, during which time standing charges had to be maintained, with the result that the anticipated substantial profit has been turned into a substantial loss; £30,000 is to be appropriated from the reserve fund towards the loss.

Dublin United Tramways Co. (1896), Ltd.—An extraordinary general meeting of this company was held on 23rd ult, when the proposed increase of capital, passed at the recent annual meeting, was confirmed.

Buenos Ayres Grand National Co., Ltd.—At an extraordinary general meeting, held at Winchester House, E.C., on 24th ult., the provisional agreement for the sale of the undertaking to the Anglo-Argentine Tramways Co., Ltd., was approved by a large majority.

Mansfield and District Tramways, Ltd.—The annual meeting was held on February 26th, Mr. A. R. Holland presiding. The receipts for the year were £18,628, as compared with £17,312 for 1907. After payment of debenture interest and preference dividend there is a balance of £2,138. The directors recommended transferring to reserve for depreciation and redemption of debentures, £1,200, and carrying forward £938. The directors considered it prudent not to construct the extension referred to in last year's report until the development of the district was somewhat more advanced. The chairman said that the traffic receipts showed a very material increase as compared with 12 months ago, *i.e.*, £1,300. The traffic expenses, too, had been reduced. They had carried a quarter of a million more passengers, and the cars had traversed 37,000 miles more than last year. He thought there was reasonable ground for looking forward to a dividend on the ordinary shares next year.

Scarborough Electric Supply Co., Ltd.—The directors' report for the year 1908 states that the amount of energy supplied was in excess of that supplied during 1907, but the receipts suffered mainly owing to the reduced net price for current. The capital outlay during 1908 was £932, as against £1,330 for 1907. The accounts showed that, after placing the sum of £750 to depreciation account, there was a balance on revenue account of £3,944. The directors recommend that a dividend be paid (free of income-tax) at the rate of 3 per cent. for the year, which will absorb £3,000, leaving £944 to be carried to 1909.

The annual meeting was held on Tuesday.

Hadfield's Steel Foundry Co, Ltd.—A dividend at the rate of 2s. per share is to be paid, together with a bonus of 6d. per share; £27,090 is carried forward.

Globe Telegraph and Trust Co., Ltd.—A quarterly interim dividend of 2s. per share on the ordinary shares is announced.

Western Telegraph Co., Ltd.—The directors have declared the second quarterly interim dividend of 3s. per share, free of income-tax, for the year ending June 30th, 1909, being at the rate of 6 per cent. per annum. The transfer books will be closed from March 18th to the 24th, and the dividend will be payable on March 25th.

Direct Spanish Telegraph Co., Ltd.—Dividends at the rate of 10 per cent. per annum on the preference shares, and at the rate of 4 per cent., free of income-tax, on the ordinary shares, both for the half-year ended December 31st, 1908, and payable on April 1st, are recommended.

Brompton and Kensington Electricity Supply Co., Ltd.—Including the balance brought forward from 1907 there is £38,381 credit balance at December, 1908. After paying 7 per cent. preference dividend, a final dividend on the ordinary shares, making a total of 10 per cent. for the year, is recommended. £8,000 is placed to credit of depreciation fund, £2,000 to reserve, and £9,400 is carried forward. The ordinary dividend in the previous year was at the same rate. The meeting is to be held next Thursday.

Italy.—La Società Lombarda per la Distribuzione d'Energia Electrica, of Milan, is declaring a dividend of 11 per cent. for the last financial year, as compared with 10 per cent. for the preceding 12 months.

Notting Hill Electric Lighting Co., Ltd.

The twenty-second ordinary general meeting was held on Tuesday at Winchester House, E.C., under the presidency of Sir W. Crookes, F.R.S.

The Chairman, in proposing the adoption of the report (see Electrical Review, February 26th, page 354), said that the capital expenditure last year included £2 600 for mains, and a large part of that sum was spent in the northern part of their district, where they were arranging to co-operate with the Metropolitan Co., which they were able to do under the powers of the Electric Lighting Acts passed last year. The generating expenses last year were £10,445, against £11,003 for 1907, and although they purchased from the Wood Lane works 148,500 additional units, the total cost showed a reduction of £408. The total revenue showed an increase of £850, and the net profit an increase of £480. The net revenue, after allowing for the various items chargeable against it, showed a balance of profit of £10,908. That was about £90 less than last year, but they had transferred £300 more to the reserve fund. They generated for themselves, and at Wood Lane, 2,800,000 units, and for the first time in the company's history they sold over 2 million units. Looking back over 20 years to the time when the company was started with a view of supplying electricity to a few friends in the district, he could not help feeling gratified at the position it had attained. They commenced supplying in 1891 with 77 customers, and there were now over 2,800 connected to the mains. With regard to the future, there was every reason to believe that the business would increase. The public already recognised that the metallic-filament lamp, now being manufactured in large quantities up to 220 volts, showed a saving to the consumer in spite of the extra cost of the lamp, and there was no doubt that the price would be rapidly reduced. Consumers could obtain more light at less cost, and that would actually be to the benefit of the company, as the cheaper the light, the more inducement there was to those who now used gas to change their system. The smaller quantity of current consumed by the new lamp might affect their sales for a year or two, but that would be set off and more than compensated for by the addition to the number of their customers, which, he felt, was bound to ensue. The contract which the Wood Lane works entered into last year for supplying the Franco-British Exhibition turned out profitable, and a new contract for the supply of the Exhibition this year, which should be equally satisfactory, was in course of completion. The Bill, which they joined with the Kensington and Knightsbridge, the St. James' and the Westminster Companies in promoting, was passed by Parliament giving the four companies the right to mutually assist and to arrange for the management and working of any of the generating stations belonging to the companies, and for other purposes. The Bill promoted by the remainder of the companies also passed, and gave power to all the electric lighting authorities in London—companies and Borough Councils—to assist one another. It was anticipated that by the aid of those two Bills arrangements might be made to improve the position of the various companies. The matter would receive the earnest consideration of the board in the near future; but as the Bill was only passed at Christmas, there had not been time to consider developments. The London and District Electricity Supply Bill, which was promoted last year with a view of controlling the electric supply of London, and to some extent to act in competition with existing companies, was thrown out by Parliament, and it was to be hoped that that was the last of a series of Bills which had been brought in during the last few years on somewhat similar lines, which had been the cause of delaying the development of the industry, and in addition must have cost the promoters and the existing companies anything between £250,000 and £500,000. That large sum had been practically thrown away, although he felt their position was stronger to-day and less assailable. Incidentally the conflict had brought them into closer contact with other companies, and taught them to co-operate for mutual benefit.

Sir R. B. Martin, Bt., seconded the motion.

Replying to a Shareholder, the Chairman said the directors at present had no proposal to submit with regard to the founders' shares, but they were quite willing to effect any rearrangement of the capital which would give the founders a really negotiable security, provided it preserved their rights.

The report was then adopted.

British Electric Transformer Co., Ltd.

Mr. J. F. Albright (chairman) presided at Salisbury House, Old Broad Street, on Tuesday, over the sixth ordinary general meeting of the above company.

In moving the adoption of the report (see Electrical Review, February 26, p. 354), the Chairman said that on the liabilities side of the balance-sheet under trade creditors, they owed some £2,100 less than at the end of 1907, and the depreciation reserve had increased by the £1,300 allocated thereto at the last meeting. On the assets side, patents remained virtually unchanged, and the same remark applied to goodwill and preliminary expenses. The latter, however, were written down this year to £1,266. With regard to the freehold land and buildings, they had this year had the usual quinquennial valuation made, the result showing that during the last five years they had over-depreciated to the extent of £187, so that no addition was made this year to the depreciation reserve. Investments had been increased by £66. They believed that the value of the investments was likely in the near future to increase, and they had not written down investments permanently, but in putting aside the sum of £3,000 out of this year's profits to a general reserve, they had the present value of investments before them. Stock and work in progress had increased about £2,170, which they were satisfied was a correct and conservative valuation. Sundry debtors and bills receivable together were about £185 less than in 1907, but on the other hand, the trade creditors were some £2,100 less, so that the actual position was better and was being worked closer up-to-date. They had nearly £6,000 more cash in hand than at the end of 1907. In the profit and loss account, the general charges were somewhat less than for the previous year, in spite of the extra work done and the serious competition they were called upon to face. Bad debts were made up chiefly of two debts owed them by companies in liquidation, and they had, therefore, written the amounts off, but were fairly confident that in each case the company would save a considerable portion of the debt. The gross profit on trading was in excess of last year by more than 50 per cent., in spite of the introduction of new metallic-filament lamps. The introduction of these lamps had prevented transformer extensions for lighting purposes, during the past year, by electricity supply authorities. They were of opinion, however, that this decrease in the demand for transformers for lighting purposes was only temporary, and believed that when these lamps were more widely used, more transformers would be required for these purposes than in the past. The net profit was nearly double that of last year. With regard to the business of the company generally, the harmonious working of the board solely for the benefit of the company was steadily placing their affairs on a sound and secure basis. They had succeeded this year, in spite of the severest competition ever known in the English electrical trade and in spite of bad times generally, in realising a fair profit; and though he was very reluctant to prophesy, they hoped to be able to do as well, or better, in 1909. The Canadian agency which he alluded to last year had not yet matured, but the Japanese one had; and in addition they had arranged four other agencies—two in Europe, one in South Africa and one in South America—the result of which, he hoped, would be felt in 1909. In conclusion, the chairman said the only question which could arise was as to the wisdom of paying a 3½ per cent. ordinary dividend, but it was the unanimous feeling of the board that they ought to have it.

Mr. Berry seconded the motion, which was carried.

American Westinghouse Co.—The New York *Electrical World* says that the selection of Mr. Robert Mather as chairman of the board of directors of the Westinghouse Electric and Manufacturing Co. is regarded as a very satisfactory move. Mr. Mather, while he is a lawyer by profession, is best known as an able financier and man of affairs. As chairman of the board of directors, he will have full charge of the financial affairs of the Westinghouse Co. His selection is due to those financial and banking interests which have united to make the rehabilitation of the company possible. He is president of the Rock Island Co., vice-president of the St. Louis and San Francisco Railroad Co., and head of the law department of all the Rock Island and 'Frisco lines. In addition to this, Mr. Mather has a wide and intimate acquaintance with the officials of all the great roads centring in Chicago and in that section of the country. Just at this time when Chicago and almost all the other large cities of the West are beginning to clamour for the electrification of all urban and suburban lines, the advantage to the Westinghouse of having at the head of its board a man in close touch with railroad officials is apparent. With the return of prosperous or even normal business times, it is probable that the electrification of steam road terminals will be rapidly pushed forward, and this branch of the industry will certainly rival the development of new lighting and traction schemes. Already a Bill has been passed by the Illinois Legislature requiring the railroads centring in Chicago to change from steam to electricity within the city limits. Many of the larger roads are also considering the policy of operating their suburban lines by electricity. All of this means large business for the manufacturers of heavy electrical apparatus, and the Westinghouse will lose nothing by having "a friend at court" when the consideration of contracts comes. The practical direction of the company's affairs will remain entirely in the hands of Mr. George Westinghouse, the president.

Toronto Electric Light Co.—At the annual meeting held on February 9th at Toronto, Sir Henry Pellatt, president, and the vice-president, Mr. W. D. Matthews, declared they did not fear civic competition. In their opinion the rates quoted by the city and the Hydro-Electric Power Commission, were too high. Mr. Matthews said that so long as the taxpayers generally were not compelled to put up for deficits for a civic plant there was nothing to fear. The company had an income during the year of $1,155,582, and after paying a dividend at 8 per cent. and all charges, including interest on debentures, carried forward $150,616. —*Montreal Witness.*

French Thomson-Houston Absorption.—The directors of the French Thomson-Houston Co. have agreed to a scheme for the absorption of the undertakings of the Thomson-Houston de la Méditerrannée and of the Compagnie des Accumulateurs Union, subject to the approval of forthcoming extraordinary general meetings of the three enterprises. It is proposed to issue 40,000 new shares of the French company for this purpose, of which 26,666 will be offered in exchange for the shares of the Mediterranean Co. and 1,100 shares for the Union Co., whilst the remainder will be offered to the present shareholders in the French T.-H. Co. at the price of £26 each.

South Metropolitan Electric Light and Power Co., Ltd.

Mr. H. St. John Winkworth (chairman) presided at Winchester House, E.C., on Monday, over the annual general meeting of the above company.

The Chairman moved the adoption of the report (see Electrical Review, February 26th, page 354), and said that the total lamp connections up to the end of the year amounted to 177,628, an increase of 17,248. Of these, 5,055 were for power, and 12,193 for lighting. The new consumers connected were 266, compared with 181 last year, and the number now connected was 3,649. The total units sold were 3,303,817, as compared with 2,946,607 for the previous year. The average price received for the year was 2·88d. per unit, as compared with 3·23d., an increase of about 11 per cent., which was largely due to the greater proportion sold for power purposes, and a reduction in that sold for lighting purposes due to the extended use of the metal-filament lamp. The cost of production was reduced from 1·32d. to 1·16d. per unit sold—a decrease of about 12 per cent. Had the sales for lighting increased in the same proportion as last year, it would have resulted in an increased revenue of between £2,500 and £3,000, which might be regarded as a temporary loss from the introduction of the more economical lamps. There was no doubt, however, that the reduction in the cost made the business more secure, as it induced the consumer to make greater use of it, and widened the area. Now that the cost of electric light had been reduced to about the same level as gas, it was evident that its superior qualities in the way of cleanliness, &c., would cause an increased demand in several of the thickly populated districts which they served. It was desirable that mains should be laid in those districts, from which a large revenue might be confidently anticipated. Further mains were now being laid, and steps taken to secure new business. It was estimated that, by the economical working of the power house, an increase of 50 per cent. of power output and an increased revenue of £20,000 (which should be obtainable within a reasonable period) could be produced at an exceptional cost not exceeding £5,000, so that, notwithstanding the temporary loss from the new lamp, the board looked for a great improvement in the future. The total capital expenditure to December 31st, 1907, less depreciation, was £495,929. The expenditure during the year amounted to £38,321, and if they deducted the net amount of £5,900 placed to the credit of the depreciation account (which now amounted to the substantial figure of £24,900), the net addition to capital account of the year was £32,421, which included about £25,000 in respect of the new power house, making a total amount expended on capital account, less depreciation, of £528,350. The first payment in respect of the new power house would be made this month. They recently issued £50,000 6 per cent. cumulative preference shares, and the company was now in a strong financial position. The Parliamentary fight which had been waging for four years and had cost £500,000, had terminated in favour of the existing undertakings, who were also authorised under the London Electric Supply Act to make agreements for mutual assistance, to supply railways, docks, &c., and special maximum prices were fixed for special purposes. The proprietors might be congratulated on the result, for their new power house was in as favourable a position to furnish a cheap supply as any. The company had entered into an agreement for the supply of power to a district in Kent between London and Northfleet. One of the conditions of the Trust Deed for the debenture-holders was that before any dividend was paid on the ordinary shares the company should set aside a certain sum for depreciation, and this sum had to be considerably increased this year. They had to set aside 2½ per cent. on the average capital expended, which would amount to about £13,000 for the current year. On the basis of the present revenue this would not allow of any dividend on the ordinary shares next year. The directors were, however, proposing to ask the debenture-holders to agree to some modification of the deed which would secure an ample sum for depreciation, and yet leave something available for the ordinary dividend. In conclusion, the chairman pointed out that the company was the youngest of the undertakings to supply in London, and before they had time to establish themselves the threatened invasion of the area made it necessary for them to reduce the price and to expend new capital on an up-to-date power house which otherwise could have been deferred for some years. Had the price remained as in 1904 they would last year have had an additional revenue of £16,000. The company was in a sound position, and the prospects better than at any time during their history.

Mr. H. W. Bowden, in seconding the motion, said it was gratifying to know that notwithstanding the general depression which had prevailed throughout the electrical industry during the past year, their costs per unit of production had been considerably reduced, and this would have been still more marked had the output been greater, but it did at least indicate that with the powers granted on December 21st last when the Royal assent was received to the Bill promoted by the companies for linking up, that this company ought to have a fair share of that bulk supply. For the year 1907 they had an increased output of 565,000 units, for the year 1908 the increase was 357,000, making a total output of 3,303,807 units. The coal cost per unit for 1907 was ·538d., and it was now reduced to ·46d. The works costs for 1907 was ·827d., and was now reduced to ·715d., or, in other words, the saving in cost of production was equivalent to about 4 per cent. on the capital outlay for the new power house; and, perhaps, more important still was the fact that the reduced cost per unit of production had enabled the company to continue the supply to certain factories at a fair margin of profit, which might otherwise have been served at a loss, or little or no profit, but to which supply could now be given with advantage to both producer or consumer. Last year he referred to the absolute necessity for curtailing the annual capital expenditure, and said that, in his opinion, for the ordinary growth of the business, an amount not exceeding £10,000 should be sufficient. In reference to the new turbine plant and their system of condensing mentioned by him last year, it was pleasing to know that it had continued to work efficiently and satisfactorily—in fact, had it not been for this the present low costs could not have been obtained. In order to show what an important bearing load factor had on the cost of production, on February 23rd last, with a station load factor of over 70 per cent. for the day shift, which was made up almost entirely of power units, the coal figure for the total units generated was ·17d. per unit, compared with 3d. per unit for the year. These results, and the general development and working of the undertaking to the satisfaction of the consumer, could only be attained, as they were aware, by the closest attention, zeal and devotion of the staff, and he therefore felt that their best thanks were due to them.

Mr. Wellbourne, speaking on behalf of a considerable number of shareholders in Lancashire, said that they were disappointed at the position, but their attitude was not one of hostile criticism. The ordinary shareholders had been waiting a long time for an adequate return on their money, and would like to know what the company was really doing to get business. He knew they had hard-working officials at the head, but did they have a good canvassing department? He suggested that greater attention should be paid to canvassing, and particularly in the Crystal Palace district. There were about 75,000 houses in their district, of which only about 3,700 were connected.

Mr. Powell asked if the £50,000 was fully subscribed.

Mr. Page, as a preference shareholder, said he noticed the company had power to issue £75,000 debentures, and he would like to know if they were going to issue any this year.

The Chairman said that whether they paid any dividend next year would depend upon the debenture-holders. They had a good staff of canvassers, who went out daily. They had laid new mains in various districts, and looked for a considerable amount of new business for them. They had about 50,000 houses in their area, of which about half were possible customers. The amount of capital expenditure depended entirely on the new mains laid, which again depended on the demand. They might have to issue a small amount of debenture stock during the year.

The report was adopted.

Warrants for dividends on the ordinary and 7 per cent. first preference shares for the year, and half-year, ended December 31st, 1908, respectively, have been posted.

Lancashire United Tramways, Ltd.

The directors' report shows that for the year ended December 31st, 1908, the profit amounted to £15,117. After paying the prior lien debenture stock interest, and deducting the debit in net revenue account at December 31st, 1907 (being the balance of loss on the sale of motor-omnibuses), there is a credit of £1,904, which has been carried to a depreciation account. The following is a summary of the operations of the various tramways (including the dividend received from St. Helens Tramways), which are comprised in the company's system, worked out as though they were one combined undertaking:—Traffic receipts, £68,929; miscellaneous receipts, £3,052=£71,981. Less working expenses, £45,057; general charges (including direction, management, interest, &c.), £5,428; rents of leased lines, &c., £4,961=£55,446, leaving a profit of £16,535. The receipts show an increase of £2,632 over the previous year, and the expenses have decreased by £1,053, the result being an increased profit of £3,685. The receipts per car-mile amounted to 7·70d. against 7·56d. last year, this year's figure being the highest yet obtained. Practically the whole of the profit summarised above has been brought into this company's accounts, but in the case of the Lancashire Light Railways Co., Ltd., the directors have not transferred the profit earned by that company, but have carried nearly the whole of the amount to the renewals account of that company. The scheme introduced on the South Lancashire Tramways Co. system of short-distance return fares for workpeople has shown excellent results, the number of persons carried during the year being 3,659,233 as against 2,190,513 in 1907. The sum of £874 was received as dividend on the company's holding in the New St. Helens and District Tramways Co., Ltd. The company has entered into a new agreement for the supply of electrical energy to the Atherton U.D.C. for a further seven years, on terms which it is confidently expected will increase the number of consumers of power and prove remunerative to the company. A new agreement has also been entered into with the British Insulated and Helsby Cables, Ltd., for the supply of current by that company for working the Liverpool and Prescot Light Railway at a reduced rate. This agreement came into operation on January 1st last.

On Friday, of last week, the fourth annual general meeting of this company was held at Winchester House, E.C., the Hon. Arthur Stanley, M.P., presiding.

In moving the adoption of the above report, the Chairman said the past year was an uneventful one. The service of workmen's cars which was inaugurated by the general manager showed good results. The number of passengers carried on the system had increased from 2,190,000 to 3,659,000, but by far the greater part of that increase was due to the workmen's return tickets. The St

Helens undertaking had also shown better results during the past year. They received £874 in dividends from shares held by them in that undertaking. That was the first profit the company had shown since its foundation, except in the first year, when they paid a dividend out of capital. They had only had the working of that line for two years, and although so far in this current year the figures were not so good, he believed the summer months would bring them up. They had entered into a new agreement with the Atherton Urban District Council for the supply of electricity, and although it had only been in operation a short time, the results seemed to be satisfactory. For the first time they would see that a sum had been set aside for depreciation. The results of the year had been adversely affected by the cotton strike, but as this had now been settled, the directors hoped the receipts would show a better result. They hoped to also receive a fillip in the summer from the visit of the King, who was to review the Territorial Forces in East and West Lancashire. Both the reviews would be held in parks which were on the route of their system. They were also considering the question of how they could best work in with the Territorial Association for the quicker mobilisation of forces in their districts.

Mr. J. Henderson, M.P., seconded the motion, and remarked that they were making slow, but sure, progress, and they were willing to take any opportunity of benefiting the shareholders' interests.

The report was adopted.

National Telephone Co., Ltd.

The forty-third ordinary general meeting of the above company was held on Thursday of last week, at Hamilton House, Victoria Embankment, Mr. George Franklin, the President, in the chair.

The Chairman, in proposing the adoption of the report (see Electrical Review, February 19th, page 311), said that on that occasion they had the double advantage of not merely considering the accounts for the half-year, but for the 12 months, and they were able to compare them for a period of 15 years. In the half-year the income had increased from £1,387,189 to £1,498,431, or an increase of £111,241. The working expenses and Post Office royalties had increased by £69,840. The net result for the half-year, after deducting the Post Office royalties amounting to £144,226, was a profit balance of £495,638, an increase of £21,402. The debenture and other interest absorbed £7,936 more; preference and other dividends £4,300 more, and carried to reserve fund £10,000 more, making £155,000, which practically amounted for the whole sum of £21,402. The total income that accrued in respect of the whole, year was £2,951,000 as compared with £2,702,228. The working expenses had amounted to £1,687,535 as against £1,530,092, and Post Office royalties to £283,758 as against £257,919. Those figures gave on the year a net increase of £65,492 in the divisible balance. Looking at the results of the year as a whole it would be noticed that the rate of increase during the past year, satisfactory as it might be in itself, had not shown the same growth that they had found in corresponding periods. That indicated that the rate of progress had been checked partly by circumstances arising from the great fall in trade. That and the cotton strike in Lancashire and the necessary restrictions of capital expenditure owing to the approaching termination of the business, had had a serious effect upon the telephone business. Perhaps the best way in which the shareholders could grasp the effect which bad trade had on the telephone was by being told the figures of the cessations from the system. In 1906 there were 21,181 cessations; in 1907 25,115, and in 1908 28,281. When those figures were grasped and when it was remembered that the last thing which a business man could afford to do without was his telephone, and that the worse his trade was the more necessary his telephone was, the shareholders would realise how bad trade must have been. After allowing for all cessations, there had been added to the company's system during the past half-year 12,030 stations, and during the whole year 28,791 stations, and they now had a total of 475,899 stations, of which 215,708 were on the message or measured rate. With regard to London, where they had the competition of the Post Office, they had 103,287 exchange stations and the Post Office 52,422. During the past year the company had added to their London system 10,235 stations and the Post Office had added 6,067. Those figures indicated a healthy development in both systems, and that the company's system was growing somewhat faster than that of the Post Office. Rates and taxes had increased by £7,279. There had been attempts on behalf of the local authorities to increase the company's assessments in various districts, and to adopt as a basis the revenue earned within the area in which the call originated, unmindful of the fact that telephone conversations, like other conversations, required two persons, and that the intervening wire might pass through the area of any number of local authorities. The board would do all in their power to resist the imposition of any such unfair method of assessment. The administration, management, maintenance and renewal expenses a year ago amounted to £637,863, whereas for the past year they had amounted to £687,661, an increase of nearly £50,000. That was largely due to the normal growth of the business, and an interesting item was that of £15,000 increase in the operators' wages, due to some extent to an increased number of operators, as well as to the sliding scale in regard to their wages, which had a tendency to increase the charge. Referring to the addition of £155,000 to the reserve the board were glad to continue those large additions to the reserve, which went to strengthen the company's position in view of the early termination of the business and the large expenditure on capital account required from time to time. With the purchase of the company's plant looming in the near future, and that upon a basis not of actual expenditure, but rather upon what was called "plant values," which, being interpreted, were said to mean cost price less depreciation, it would not be a surprise to the shareholders that the board had at various times had to seriously review the company's position in relation to its capital expenditure. It was a peculiarity with expenditure on telephone plant, that they had always with a continuing business to lay down plant in advance of requirements—they were never able to legislate for the moment. But as the company's business was a terminating one, and as the plant had only to be purchased at its value at the date of transfer, it would be evident to the shareholders that the time must come, if indeed it had not already come, when the company could only provide such plant as would bring revenue during the period of the business, and not to continue the provision of plant and apparatus for the future beyond 1911, with heavy charges for interest, depreciation and reinstatement against which the company would have no revenue, and would, upon the termination of the business, be paid for at possibly a depreciated value. It was not easy to compass the difficulties which would not enable the telephone business to go forward during the remaining years of the lease as a going concern, and as they would all wish. In view of this position the board had felt compelled to cease to provide plant and apparatus for 1912 and subsequent years, and would, during the years which remained to them, endeavour as far as possible to make the whole of their existing plant revenue earning within the period of the licence. That seemed to the board the true policy to pursue now they had arrived at this period. They had come to that decision with the greatest possible reluctance, because they recognised that it would have a serious effect upon the telephone service after 1911, and must also produce considerable hardship to the company's construction staff. In the interests, therefore, of the public in relation to the service after 1911, and in the interests also of the staff, the board had offered to the Postmaster-General to favourably consider any proposals for the provision of plant for 1912, and subsequent years which might ensure the company against any loss in providing for the Post Office requirements. Negotiations upon that basis were still a matter of discussion between the company and the Postmaster-General, but up to the present time he was sorry to say the difficulties between them had not been overcome. The amount expended on construction of exchange and private stations during the six months ended December 31st last was £361,079, as compared with £496,583 in the June half, and £545,752 in the corresponding half-year. The diminished outlay was attributable to the depression in trade, as well as to the restriction of expenditure to coincide with the licence period. Their policy was to continue development in those districts where the company was already carrying on business, but it would not seek to develop or spend money in new districts. He believed the company's business to-day was in a more satisfactory and a sounder condition than it had ever been in its history, and he believed that it was as well, if not better, managed than ever it had been. Whoever was suffering by reason of the lessened expenditure or anything the company was doing, it was certainly not the public. He believed that the telephone service to-day, despite all that might be said of it by their critics, was better than it had ever been. They had had remarkable testimony to the efficiency of the system recently from Mr. T. M. Bale, president of the American Telegraph and Telephone Co.—the largest telephone organisation in the world. That gentleman had recently visited England, and he had said that the telephone service since his last visit here had vastly improved, and that it was doubtless more efficient and in a better physical condition than any of the Continental systems.

Lord Harris seconded the motion, and the report was adopted.

W. T. Henley's Telegraph Works Co., Ltd.

The thirtieth ordinary general meeting of the above company was held on Monday, at the offices, 14, Blomfield Street, E.C., under the chairmanship of Mr. Sydney Gedge.

In moving the adoption of the report (see Electrical Review, February 26th, page 351), the Chairman said that notwithstanding the bad times through which the country generally had been passing, their company had managed to hold its head well above water, and to declare not only the usual dividend of 15 per cent., but also to pay it free of income-tax. That, perhaps, was a very good precedent to set if the rumours were true that amongst the henroosts which were going to be looked into for good eggs the income-tax would be one. If the income-tax was increased probably next year the shareholders would point out the good precedent of this year and suggest that it again be followed. There was no doubt that there had been bad times, and if that were a political meeting it would be an interesting subject for discussion as to the cause of these hard times, in the hope that they might suggest some remedies. He supposed a follower of the present Government would say it was owing to the wicked Conservatives who went into the South African war and involved the country in an expenditure of £250,000,000. If the shareholder was a Tariff Reformer he would say it was because of the hateful competition of Germany. Whatever his own personal views on Tariff Reform might be, he would like to see a very heavy import duty placed on all those things which the company made and in which the Germans were trying to undersell them. As a matter of fact, he would like to see a duty placed on their rivals in the same line of business, but that was not likely to come about. However, whatever the bad times might be they had by strenuous exertions on the part

of all connected with the company, by the quality of the goods they manufactured, and by looking out for new places to which they could send their goods, they had not had a bad year. They had done even better than the year before, and had amply earned the excellent dividend they declared. On the debit side of the balance-sheet last year they transferred from profit and loss £10,000 to the reserve account, and were doing the same this year. They had ample funds, and had written off £10,868 for depreciation of plant and machinery, as against £7,600 last year. The gratifying result was that they had a balance of £71,000 on trading account, as against £65,300 last year, or an increase of nearly £6,000, whilst on the net profit account they had a balance of £52,196 as against £50,320. On the same side they had a reserve under the cable-repairing contract for the Bahamas of £7,645 19s. 9d. It was in the autumn of 1891 that he went to the Bahamas, and with the full powers with which he was invested he made an excellent contract for the company. They made a contract first to construct the cable, and then they had a supplementary contract for keeping the cable in repair for 20 years. By this they had to keep a repairing fund of £7,000. The Colonial Government paid £700 a year, and the company had to pay £700 until the fund reached £6,000. When the fund stood at that sum the company had only to invest £350 of the sum and the other half was paid to the company, and several times they had drawn this £350. On January 9th, 1912, their liability would end, and whatever remained in the fund would be equally divided between the company and the colony. As 17 years had run by, there seemed a good probability that a substantial sum would be left in the fund for division. The directors had thought it desirable to increase the number of the employés who gained some benefit from the progress of the company. For a long time the managing director had had a very considerable interest in the welfare of the company, and to a less degree Mr. Holton, the engineer at Woolwich, Mr. Wright, the engineer at Gravesend, and Mr. Salmon, the secretary, had shared. There were four other officials holding responsible positions, upon whose talents and care to a certain extent the success of the company depended, and the directors had thought it right to make special agreements with them, whereby certain sums were set aside for their benefit. Last year about £600 was set aside in this way, and if the profit increased the sum set aside would also increase. The chairman referred at some length to the action of the company regarding the Territorial Forces. In the case of the office staff, they offered the men joining eight days for training with pay, and in the case of the hands they offered to pay married men 10s. a week and single men 3s. Eighteen of the staff and 11 hands had joined. That was the thirtieth meeting, and he well remembered 20 years ago when they held the meeting late to get good news. He was able to state that they would get the contract for the Bermuda cable, and that was the turn of the tide for the company. At that time if anyone had come along and offered to pay their debts and take the company over, they would probably have been glad. Then they began to pay small dividends, and increased till they had one or two of 20 per cent. They felt it right at that time to pay such a large dividend because their shareholders had stuck to their shares for years and had had little return on them. Now, however, they had settled down to a steady 15 per cent., which the directors thought better than screwing every 1d. out of the company. The result was that no company in the City had a stronger balance-sheet. In conclusion, the chairman referred in eulogistic terms to Mr. Geo. Sutton, the managing director, to whom, he said, the success of the company had been greatly due.

Mr. Geo. Sutton, in seconding the motion, said it was true the times had been bad, but the balance-sheet showed that they had maintained their position. Those responsible for the result felt the greater satisfaction from the fact that this was due, not to larger profit, but to a large turnover. The wages bill was greater than that of 1907, and, in fact, it constituted a record. They had not added to the unemployment existing in the country, but had done something to mitigate it. Some years ago he had a conversation with the chief engineer of the Post Office regarding the distribution of orders. Whether this was due to the conversation or not, he did not know, but now they got orders from the Post Office spread over the year. Their export trade for the year had practically been the same as the previous year. The business they carried forward into 1909 was rather more than that brought forward at the beginning of the year. As to the reserve account, they could raise the whole £150,000 in a few hours at present. That money had been invested in the business, and had come back to them in cash, but he did not want it to remain invested in that way—he wanted it back in the business.

A Shareholder asked if the board could not do something in the way of giving the whole of the workmen some interest in the business.

The Chairman said the directors had been long trying to think out a good way of following the suggestion, but had not yet seen their way to do it. If anyone could send in suggestions for carrying it out, the board would be glad to consider it.

The motion was carried, and the retiring directors were re-elected.

Mr. Drysdale said that Mr. Geo. Sutton had been connected with the company for 28 years, and had rendered invaluable service to the company. There were three classes of managing directors, *i.e.* (1) those who did not do any good to themselves or their shareholders; (2) those who did very well for themselves and very little for the shareholders; and (3) those who, while doing very well for themselves, did well also for their shareholders. They would put Mr. Sutton in the third class, although he was a first-class man. He proposed that the directors be authorised to expend a sum not exceeding £1,000 in commissioning an artist to paint the full length portrait of Mr. Geo. Sutton, and presenting the same to him, together with a service of plate.

The resolution was carried unanimously.

Mr. Sutton, in thanking the shareholders, said the success of the company was due to the fact that he had looked on the company as his own. It was not a usual thing for shareholders in the City of London to do honour to those who had tried to serve them.

Hove Electric Lighting Co., Ltd.

In their report for the year ended December 31st, 1908, the directors first refer to the death of Col. A. J. Filgate, late R.E., who had been chairman of the company since its formation. Mr. Carleton F. Tufnell has been appointed chairman, and Mr. F. R. Reeves has been elected to a seat on the board, with the appointment of managing director as well as secretary. The gross revenue for the year shows an increase of £1,374, the working expenses have increased by £604, and the net result is a profit of £13,463, compared with £12,693 in 1907. The progress of the company is as follows:—

Year.	Houses.	8-c.p. lamps.	Units sold.	Gross revenue.	Net revenue.
1904 ..	1,236	82,968	820,761	£19,996	£11,807
1905 ..	1,374	92,194	901,384	£21,010	£12,490
1906 ..	1,486	98,224	930,542	£21,624	£12,673
1907 ..	1,579	104,393	1,019,469	£23 321	£12,693
1908 ..	1,676	114,185	1,134,994	£25,370	£13,463

After payment of the final dividend on the ordinary and preference shares and the directors' additional remuneration for 1907, and setting aside the provision for renewals and depreciation account, there was a balance brought forward from 1907 of £497, which, when added to the net profit for the year 1908, makes an available balance, at December 31st last, of £13,961. The preference dividend to June 30th, 1908, was paid on September 1st last, and an interim dividend at the rate of 8 per cent. per annum was paid in October last, on the ordinary shares. After deducting these amounts together with the accrued debenture interest and income-tax, there remains a surplus of £8,365. The directors have decided to establish a sinking fund for the replacement of the capital at the expiration of the lease, and, with this object, have transferred to new account the premiums received on shares and debentures £18,227, and the sum of £10,346 from the renewals and depreciation account, making together £28,573, all of which is invested outside the company's business. £1,500 is to be placed to the renewals and depreciation account, and £2,500 to the sinking fund, and there is set aside a sum of £594 for the accrued preference dividend to December 31st, a final dividend being declared on the ordinary shares, payable on April 15th next, at the rate of 9 per cent. per annum, making 8½ per cent. for the year. This will leave a balance of £292 to be carried forward, after providing for the extra remuneration to the directors. The balance of the renewals and depreciation account, after the addition of the above-mentioned sum of £1,500, will be £21,104. The expenditure during the year on capital account has amounted to £3,015. The machinery, buildings and mains of the company have been kept in good repair. The petition of the Hove Corporation, for a compulsory order reducing prices for current charged by this company, has been dismissed by the Board of Trade, and the inspector in making his report bears testimony to the fairness with which the company has treated the consumers in the past.

Rhondda Tramways Construction Syndicate, Ltd.

The report of the directors to December 31st, 1908, contains the accounts of the Rhondda Tramways Co., Ltd., showing the results of working from July 11th—the date when the first section was opened—to December 31st, 1908. The amount which the syndicate receives from the Rhondda Tramways Co., Ltd., in respect of the profit from working the tramway, is £9,439, to which has to be added £73, representing interest on deposit and transfer fees, making the credit to profit and loss account £9,511. Deducting secretary's salary and office rent, directors' fees, &c., amounting to £331, there remains a profit for the period in question of £9,176. The directors recommend that a dividend of 3 per cent. on the paid up capital of the syndicate be declared and paid. This will absorb £7,491, and will leave a balance of £1,685 to be carried forward. The results, having regard to the fact that the whole of the line was not opened until November 11th, 1908, have exceeded the directors' expectations. The number of passengers carried during the period in question was 3,327,622. The gross receipts amounted to £19,254, and the expenditure to £9,816, or 51 per cent. of the gross revenue. The traffic receipts since the close of the year have been well maintained. The low working costs, considering the difficulties experienced in working the tramways during the early period, are satisfactory, and the low cost of current (1·03d. per unit) is also a gratifying feature. The sanction of the Board of Trade having been obtained to top-covers being put on the cars, the directors decided to have 25 cars fitted, and the orders have been placed. The effect of this will be that in wet or cold weather the seating capacity of these cars will be doubled, and increased receipts should follow. The directors have not yet decided when the capital of the Rhondda Tramways Co. Ltd., will be issued, but they are inclined to leave this matter over until a full year's results from the tramways are obtained, their intention being to offer the debentures and preference shares to the public, and, with the profits which they

should be able to show, there should be no difficulty experienced in getting the debentures and preference shares taken up, leaving the ordinary shares to be divided amongst the syndicate shareholders. The directors are of opinion that the ordinary shares will be a valuable property.

The meeting was held on Tuesday at Winchester House, Old Broad Street, Mr. L. B. Schlesinger presiding.

The Chairman, in moving the adoption of the above report said they had kept the shareholders well informed by circular of the difficulties and troubles they had had to contend with before the tramways were completed, but he thought he might briefly review them now. The opposition of the Taff Vale Railway Co. began with the formation of the syndicate. As a result, a Board of Trade inquiry was held, the principle point being the financial strength of the syndicate. The decision of the Board of Trade was what the directors had expected, with the exception that they thought that £200,000 in ordinary shares was too big a consideration for the services of the syndicate, and they suggested that the consideration should not exceed £50,000 for the initial scheme. That was not a matter of great importance, as the holders of the ordinary shares got all the profits available for distribution after the debenture and other interest was paid, so they agreed to 200,000 shares of 5s., instead of 200,000 of £1 each. One would have thought that after that decision everything would have been plain sailing. Unfortunately, that was not the case, as the Taff Vale Co. commenced further vexatious opposition causing many months' delay in completing the contract. The Rhondda Urban District Council had to make certain widenings, alterations to road levels, and reconstruction of bridges before the tramways could be completed. The Taff Vale Co. objected to the Council strengthening the bridges, but the decision went against the Railway Co. They appealed against the arbitrator's decision, and although their appeal was dismissed with costs, the proceedings caused further great delay. There was great delay on the part of the Rhondda Council in completing their road improvements and widenings and the strengthening of the bridges, but after negotiations a satisfactory agreement was arrived at, under which the Council undertook to complete their road works by June 30th, 1908, and to allow sections of the tramways to be opened as and when completed, and to waive the rental in respect of those sections until the whole undertaking was completed and opened for traffic, and the lease was not to commence until the undertaking had been completed and passed by the Board of Trade. Had these difficulties not been met with the contractors would have finished their work before December 30th, 1907, as far as the tramways were concerned. They had provisionally arranged to take their current from the South Wales Power Co., but it got into financial difficulties, and it became necessary to arrange for the construction of a generating station to supply current to the tramways. A separate company was formed for that purpose, the tramway company undertaking to take all its supply during the lease from them and to pay all expenses. The contractors of the tramways—the National Electric Construction Co., rendered valuable financial assistance in forming the supply company, and the whole of the debentures issued were placed at par. The first section of 6½ route miles of tramways was opened on July 11th, and from that date to September 1st that section only was being worked, and owing to delay in the delivery of the generating plant only ten cars were able to be run. On September 2nd a further 4 miles 6 fur. were opened, and they were able to put on 16 cars, and their receipts for the nine days amounted to £1,156. On September 12th they opened another 2½ miles, and from that date to September 24th—12 days—their receipts were £1,810, and from September 2nd to September 24th, a period of 22 days, they carried 503,000 passengers, as compared with 597,000 carried in 51 days between July 11th and September 1st. On November 11th the tramways were finally completed and opened, and from that date to December 31st, a period during which tramway receipts were supposed to be low, their average receipts per week had amounted to £865. Since the close of the year the receipts had been well maintained, and during the last week or two had been on the increase. The number of passengers carried to December 31st was 3,327,622, and the average receipts per car-mile 12·2d. Having to erect their own generating station had, after all, proved to be in their interests, seeing that they had got their current at 1·03d. per unit after all expenses had been allowed for, and when they got all their cars running the expenses should decrease to ·90d. per unit. About five weeks ago a strike was threatened, and last Saturday week the directors received a telegram stating that no cars were out. They told their manager to agree to the terms of the men, with one or two exceptions, and at 4 o'clock on the same afternoon the strike was settled and the cars taken out. They realised that they had a big traffic to deal with, and that it was to their interests to have a contented and efficient staff. They were having top covers fitted to 25 of the cars, and there was no doubt that that would lead to largely increased receipts in the winter months and in wet weather. The original estimate of construction amounted to £227,000, but while the work progressed, the contractors and the consulting engineer were of opinion that the undertaking would be considerably benefited if certain portions of the line, where single track had been agreed upon, were doubled, and the contractors also supplied land for the generating station. The extras claimed amounted to £17,000 odd, but the question was submitted to Mr. Waller, and ultimately the contractors agreed to £13,000 odd in full settlement. In conclusion, he said he thought they had every reason to be satisfied with the results to date, and he believed the company had a very prosperous future before it.

Mr. Carr Saunders seconded the motion, and the report was adopted.

Metropolitan Electric Supply Co., Ltd.

The report of the directors for the year ending December 31st, 1908, says that the capital expenditure, which at the end of 1907 amounted to £1,840 877, has now reached a total of £1,874,559, being an increase during the year of £33,682. The gross revenue for the year amounted to £180,672, as compared with £178,684 in 1907, being an increase of £1,988. The working expenses, which in 1907 were £83,334, amounted in 1908 to £80,698, being a decrease of £2,636. The balance at the credit of the revenue account, before providing for depreciation, is £99,974. The directors have set aside £15,000 as an addition to the depreciation and reserve fund, carrying to the credit of the net revenue account (No. 5) the sum of £84,974. This sum, with the balance brought forward from last account, interest and dividends on investments, and other receipts, makes a total of £98,341. After deducting interest on debenture stocks and loans, dividend on preference shares and other charges, there remains a balance of £55,972. An interim dividend of 2s. 6d. per share (being at the rate of 5 per cent. per annum) on the ordinary share capital, amounting to £25,000, was paid on August 7th, and the directors recommend that a further dividend of 3s. per share (being at the rate of 6 per cent. per annum), on such shares be now paid, making a total distribution for the year of 5s. 6d. per share, or 5½ per cent. This will absorb a further sum of £30,000 and leave a balance of £972 to be carried forward to the next account. The balance at the credit of the depreciation and reserve fund now amounts to £235,355. During the year new connections representing the equivalent of 69,188 8-c.p. (or 30-watt) lamps were added to the company's system, making a total connection at the end of the year of 804,304 lamps. The Bill promoted last session by the London and District Electric Supply Co. was thrown out by a Select Committee of the House of Commons. The Bill deposited jointly by this and certain other companies was passed in a form authorising the linking up of the undertakings of companies and local authorities in London. It also contains provisions transferring the purchase powers of the local authorities to the L.C.C., still leaving the company's freehold property at Willesden exempt from any rights of compulsory purchase. With deep regret the board have to record the death of their colleague, Sir Eyre Massey Shaw, K.C.B., who was a director of the company for 15 years, during part of which period he was also chairman. It is not proposed to fill up this vacancy at present.

Chelsea Electricity Supply Co., Ltd.

The directors' report for the year ended December 31st, 1908, to be presented at the annual meeting to be held on Wednesday next, shows a profit for the year amounting to £33,791, which with £905 brought forward, and £342 for interest, makes a total of £35,038. After deducting £7,875 for interest on debenture stock, £900 for interim dividend 6 per cent. on preference shares, and £4,944 for interim dividend on ordinary shares at the rate of 4 per cent. per annum, there remains a balance of £21,319, which the directors recommend shall be appropriated as follows:—To credit of renewals and depreciation fund, £11,854; to credit of debenture stock premium redemption fund, £535; to amount written off cost of extinction of founders' shares, £526; to final dividend on the preference shares at the rate of 6 per cent. per annum, making 6 per cent. for the year, £900; to final dividend on the ordinary shares at the rate of 5 per cent. per annum, making 4½ per cent. for the year, £6,179; leaving to be carried forward, £1,025. The number of 8-c.p. lamp equivalents connected on December 31st, 1908, was 251,110, an addition of 10,375 during the year, and the total number of units sold was 3,654,608, being 105,980 more than the previous year. The Bill giving the companies powers of association, which was sanctioned by the shareholders last year, has now, with some modifications, been passed by Parliament and has received the Royal Assent. The Act postpones by three years the date when the purchasing authority can exercise its powers, and is in other respects beneficial to the company.

Oxford Electric Co., Ltd.

The directors' report for the year ended December 31st, 1908 (submitted at the meeting held March 5th), says that the revenue account shows a profit (including £978 brought forward) of £14,670. After providing £2,074 for debenture and other interest, and writing off £999 13s. on account of hire-purchase and college installations, the balance available for dividend is £11,596. A dividend at the rate of 7 per cent. per annum, free of income-tax, on the ordinary share capital (whereof 2½ per cent. was paid in September last) absorbs £7,000; 5 per cent. on the preference requires £1,375; there is placed to credit of reserve and renewal of plant account £2,019, leaving to be carried forward £1,203. Reserve and renewal of plant account has been charged with the cost of plant replaced by machinery and mains of larger capacity and efficiency. It is estimated that at December 31st last there was the equivalent of over 104,000 8-c.p. lamps connected to the mains. The lamp and motive power connections have been greater than in any previous year, and notwithstanding the extensive use of more efficient lamps, the revenue has exceeded that of the preceding year. The plant has been maintained in efficient order, and a thorough overhaul of the steam plant effected. The supply mains of the company have been extended in the Banbury, Woodstock, Morton, Chadlington, Portland and Hill Top Roads, and in St. Aldate's, Becket and Orchard Streets.

MARKET QUOTATIONS.

Wednesday, March 3rd.

CHEMICALS, &c.		Latest Price.	Fortnight's Inc. or Dec.
a Acid, Hydrochloric	per cwt.	5/-	..
a ,, Nitric	,,	22/-	..
a ,, Oxalic	,,	28/-	..
a ,, Sulphuric	,,	5/6	..
a Ammoniac, Sal	,,	42/-	..
a Ammonia, Muriate (crystal)	per ton	£33 10	..
a ,, ,,	,,	£30	..
a Bleaching powder	,,	£5 10	..
a Bisulphide of Carbon	,,	£18	..
a Borax	,,	£16	..
a Copper Sulphate	,,	£21	..
a Lead, Nitrate	,,	£28 10	..
a ,, White Sugar	,,	£28 10	10/- inc.
a ,, Peroxide	,,	£32	..
a Methylated Spirit	per gal.	2/6	..
a Potassium, Bichromate, in casks	per lb.	8¾d.	..
a Potash, Caustic (75/80 %)	per ton	£20	..
a ,, Chlorate	per lb.	8¾d.	..
a ,, Perchlorate	,,	9d.	..
a Potassium, Cyanide	,,	7d.	..
a Shellac	per cwt	85/-	..
a Sulphate of Magnesia	per ton	£4 10	..
a Sulphur, Sublimed Flowers	,,	£6 10	..
a ,, Recovered	,,	£5 10	..
a ,, Lump	,,	£5	..
a Soda, Caustic (white 70 %)	,,	£10 15	..
a ,, Chlorate	per lb.	3¾d.	..
a ,, Crystals	per ton	£3 5	..
a Sodium Bichromate, casks	per lb.	9d.	..
a ,, Cyanide (basis 100 %)	,,	7d.	..
METALS, &c.			
b Aluminium Ingots, in ton lots	per ton	£70	..
b ,, Wire, in ton lots	,,	£112	..
b ,, Sheet, in ton lots	,,	£120	..
p Babbitt's metal ingots	,,	£50 to £135	..
c Brass (rolled metal 2" to 12" basis)	per lb.	7¼d.	..
c ,, Tube (brazed)	,,	8¼d.	..
c ,, ,, (solid drawn)	,,	7¾d.	..
c ,, Wire, basis	,,	6d.	..
c Copper Tubes (brazed)	,,	9½d.	..
c ,, ,, (solid drawn	,,	8¾d.	..
g ,, Bars (best selected)	per ton	£71	£1 dec.
g ,, Sheet	,,	£71	£1 dec.
g ,, Rod	,,	£71	£1 dec.
e ,, (Electrolytic) Bars	,,	£60	£2 dec.
e ,, ,, Sheets	,,	£76 10	£2 dec.
e ,, ,, Rod	,,	£64 10	£2 dec.
e ,, ,, H.C. Wire	per lb.	7¼d.	¼d. dec.
f Ebonite Rod	,,	3/3	..
f ,, Sheet	,,	8/-	..
n German Silver Wire	,,	1/6	..
h Gutta-percha, fine	,,	5/6 to 6/6	..
h India-rubber, Para fine	,,	7/24	1d. dec.
i Iron Pig (Cleveland warrants)	per ton	47/3	9d. dec.
l ,, Wire, galv. No. 8, P.O. qual.	,,	£14	..
g Lead, English Ingot	,,	£13 15	..
m Manganin Wire No. 28	per lb.	8/-	..
g Mercury	per bot.	£8 7 6	..
d Mica (in original cases) small	per lb.	6d. to 1s.	..
d ,, ,, ,, medium	,,	2/6 to 4/-	..
d ,, ,, ,, large	,,	4/6 to 8/6	..
p Phosphor Bronze, plain castings	,,	1/- to 1/1	dec.
p ,, ,, rolled bars & rods	,,	1/1½ to 1/3	dec.
p ,, ,, rolled strip & sheet	,,	1/3½ to 1/6	dec.
o Platinum	per oz.	100/-	variable.
e Silicium Bronze Wire	per lb.	9½d.	..
r Steel Magnet, in bars	per ton	£55	..
g Tin, Block (English)	,,	£130 10 to £131 10	..
n ,, Wire, Nos. 1 to 16	per lb.	1/9	..
p White Anti-friction Metals:—			
"White Ant" brand	per ton	£35 to £60	..
k Zinc, Sh't (Vielle Montagne bnd.)	,,	£25 15	10s. inc.

Quotations supplied by—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d F. Wiggins & Sons.
e Frederick Smith & Co.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakspeare.
h Edward Till & Co.
i Bolling & Lowe.
k Morris Ashby, Ltd.
l Richard Johnson & Nephew, Ltd.
m W. T. Glover & Co., Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p The Phosphor Bronze Co., Ltd.
r W. F. Dennis & Co.

New York Edison Co. — The New York *Electrical World* states that the annual meeting of this company was held February 9th. The only information concerning the financial operations of the Edison Co. are to be obtained from the figures submitted to the Public Service Commission. These go so extensively into detail that the actual earnings of the company are hard to determine. The figures show, however, that in the year 1907 the company manufactured and delivered energy for lighting and power at an average cost of 4·69 cents per KW.-hour. This charge included all costs, taxes and fixed charges. The company received from the sale of this current an average price of 6·49 cents, leaving a net profit per kilowatt of 1·80 cents. As the number of kilowatt-hours sold to the public was 209,024,000, there would appear to have been a profit on the year's sale of $3,762,432. This is equal to 8·3 per cent. on the entire capital stock. The earnings for 1908 are largely a matter of conjecture, but it is known that in spite of the generally depressed condition of business the New York Edison Co. made large gains over the previous year. During the year 1908, 34,831 new contracts were made for the supply of electrical energy, aggregating an equivalent of 2,765,616 incandescent lamps of 16-C.P. The net increase for the year was 882,939 in such lamp units. This is an increase of 14·9 per cent. over the previous year in the volume of business.

STOCKS AND SHARES.

Tuesday Afternoon.

Another European crisis has come, and gone, the decisive action of the drama occupying less than a week. Russia's action is supposed to have snatched Europe away from the brink of a Continental war. Wherefore Consols rose from 83⅝ to 84⅞, in four days, and previous to deduction of the dividend other prices followed suit. Business shows a faint tendency to revive, but nobody is so foolish as to suppose that the Near Eastern trouble will settle down into limbo without another fling or two at the peace of Europe and of the stock markets.

Electricity supply shares of the London companies are quiet, the tendency being rather downward, if anything. The batch of dividends and reports recently presented is considered as satisfactory as could have been expected in the circumstances. It is the current half-year whose results are awaited with some misgiving, because of the effect of the metal-filament lamps. Once the corner is turned at which the industry begins to get over the early diminution of current on account of the new lamps, recovery should be as rapid as was that of the gas companies after the first check administered by the introduction of the incandescent mantle. Against the immediate loss of revenue caused by this factor, there must be set the saving in law costs which withdrawal of all competing schemes will enable the companies to show, there will be economies in working due to the facilities now permitted in the way of linking-up, and there will be the advantages derivable from concentration of energies upon practical, as distinct from lawsuit, work. After the present six—or may be twelve—months the industry should feel the benefit of the new lamps in stimulating fresh consumption, and then the electrical supply business should once more slide into calmer and much more prosperous days.

Railway stocks are very quiet, with very few noteworthy features. Great Northern and City Preferred Ordinary are evidently in demand for some reason or another, the shares being dealt in at half a sovereign on Monday last. Metropolitans and Districts remain depressed, and City and South London Ordinary fell ½ to 27. Charing Cross 4 per cent. Debenture hardened to 91, which is only a point below the price of the Great Northern, Piccadilly and Brompton stock, while "Bakerloo" 4 per cent. Debenture is well maintained at 96.

Telegraph descriptions are somewhat dull. Indo Europeans shed £1, Cuba Telegraphs 10s., and Westerns ½, although West India and Panama First Preference rose ½. The American group is unsteady, but American Telephone capital stock regained a point of its fall of last week. National Telephone 3½ per cent. Debenture hardened to 99, and Telephone Company of Egypt 4½ per cent. Debenture stock has slightly improved. A few sales of Globe Telegraph and Trust Preference caused the price to recede half-a-crown.

The usual lively movements continue in the Mexican-Canadian group of tramway, light and power undertakings. Rio Trams have recovered to 100, while Mexico Trams slipped back to 136. Mexico Light and Power securities are lower, and the 5 per cent. gold bonds of the Mexican Electric Light Company are also easier. Little has been heard of the "Brussels trouble" since markets quieted down after their Near Eastern scare last week.

British Electric Tractions are flat, but other traction descriptions keep very steady. British Westinghouse Debenture stock lost 2 points, falling to 42½. Industrials are almost featureless. Telegraph Constructions moved back 10s. Castner-Kellners have rallied from their dulness, and Henley's Debenture stock is up to 106 again.

Great Orme Electric Tramway Co., Ltd.—The annual meeting of this company was held at Llandudno on Friday. Mr. David Jones (chairman), in moving the adoption of the report, stated that the receipts during the last half-year, were £250 less than for the corresponding period of 1907, owing to the stormy and wet weather experienced. The working expenses were less by £20. The statement of accounts, which showed a debit balance of £418, and total liabilities by way of overdraft and bonds of £6,000, which will fall due gradually, was unanimously adopted.

Negotiations with the Llandudno Council for the purchase of the undertaking by the municipal authority having fallen through, it was proposed and carried, that the directors approach the Llandudno Electric Railway Co., with a view to a branch line being constructed to the mountain tramway terminus in Church Walks.

SHARE LIST OF ELECTRICAL COMPANIES.

TELEGRAPH AND TELEPHONE COMPANIES.

Present Issue.	NAME.	Stock or Share. *	Dividends for the last four years. 1905.	1906.	1907.	1908.	Closing Quotations Feb. 23rd.	Closing Quotations Mar. 2nd.	Business done week ended Mar. 2nd, 1909. Highest	Lowest.	Rise + or Fall −	Present Yield per cent. £ s. d.
35,000	Amazon Telegraph Co.'s shares, Nos. 1 to 35,000	10	Nil	Nil	Nil	..	2¾ — 3¼	2¾ — 3¼	..	..	..	Nil.
136,700	Do. do. 5 % Debs., Nos. 1 to 1,250 Red.	100	5 %	5 %	5 %	5 %	92 — 95	91 — 94	91½	..	−1	5 6 5
$181,551,400	American Telephone & Telegraph, Cap. Stock ..	$100	7¾%	8 %	8 %	..	130 —131	131½—132½	129⅝	129⅜	+1½	6 0 9
$53,000,000	Do. Collat. Trust, 4% Bonds, 1 to 28,000 and 53,001 to 78,000	$1000	4 %	4 %	4 %	4 %	95 — 97	95 — 97	..	..	..	4 2 8
598,180	Anglo-American Telegraph	Stock	8½%	8½%	8½%	£23 4s.	55 — 58	55 — 58	55½	..	..	5 5 8
8,200,910	Do. do. do. 6 % Pref.	Stock	6 %	6 %	6 %	6 %	99 —101	99 —101	100½	99½	..	5 18 10
8,200,910	Do. do. do. Deferred	Stock	½%	1½%	1 %	8/-	13½— 13⅝	13½— 13⅝	13⅝	13½	..	2 17 4
50,000	Anglo-Portuguese Tel., 5 % Mort. Deb. Stock Red.	100	5 %	5 %	5 %	5 %	100 —102	98 —100 xd	..	..	..	5 0 0
44,000	Chili Telephone, Nos. 1 to 44,000	5	8	8	8	8	7¾— 8⅜	7¾— 8⅜	..	..	..	4 15 6
2,431,350	Commercial Cable Stng. 500 year 4 % Deb. Red.	Stock	4 %	4 %	4 %	4 %	84½— 86½	84½— 86½	86	85	..	4 12 6
16,000	Cuba Telegraph	10	5 %	5 %	6 %	..	8 — 9	7½— 8½	7⅞	..	— ⅛	6 6 4
6,000	Do. 10 % Pref.	10	10 %	10 %	10 %	10 %	16½— 17½	16½— 17½	..	..	..	5 14 3
12,981	Direct Spanish Telegraph, Ord.	5	4	4	4	..	3 — 3½	3 — 3½	..	..	..	5 14 3
6,000	Do. do. 10 % Cum. Pref.	5	10 %	10 %	10 %	..	8 — 9	8 — 9	..	..	..	5 8 1
80,000	Do. do. 4½ % Debs.	50	4½%	4½%	4½%	4½%	99 —102	99 —102	..	..	..	8 16 6
60,710	Direct United States Cable	20	4½%	4½%	4½%	4½%	12½— 12⅝	12½— 12⅝	12⅝	22	..	6 9 3
53,700	Direct W. India Cable, 4½ % Reg. Deb., 1 to 1,200, R.	100	4½%	4½%	4½%	4½%	99⅜—101½	99⅜—101½	101	..	..	4 8
4,000,000	Eastern Telegraph, Ord. Stock..	Stock	7 %	7 %	7 %	..	128 —131	128 —131	130	128	..	5 6 10
2,000,000	Do. 8½ % Pref. Stock..	100	8½%	8½%	8½%	..	84½— 86½	84½— 86½	86½	85	..	4 0 11
1,896,706	Do. 4 % Mort. Deb. Stock. Red. ..	Stock	4 %	4 %	4 %	4 %	103½—105½	103½—105½	105	104½	..	3 17 8
800,000	Eastern Extension, Australasia, and China Tele.	10	7 %	7 %	7 %	..	11⅞— 12⅜	11⅞— 12⅜	12⅝	12⅜	..	5 13 2
752,400	Do. 4 % Deb. Stock	Stock	4 %	4 %	4 %	4 %	100 —102	100 —102	..	..	..	3 18 5
200,000‡	East & S. Afric. Tel., 4 % Mt. Db. (Mauritius Sub.) 1 to 8,000	25	4 %	4 %	4 %	4 %	100½—102½	100½—102½	..	..	..	3 18 1
181,127	Globe Telegraph and Trust	10	5⅛%	5⅛%	5⅛%	..	10⅛— 10⅝	10⅛— 10⅞	10⅝	10⅜	+ ⅛	5 9 8
181,127	Do. do. 8 % Pref...	10	6 %	6 %	6 %	..	18 — 18½	18 — 18½	18⅝	18	..	4 8 11
150,000	Great Northern Telegraph, of Copenhagen.. ..	10	24%	20 %	20 %	..	30 — 32	30 — 32	..	..	..	6 5 0
24,800‡	Halifax and Bermudas Cable, 4½ % 1st Mort. Debs., within Nos. 1 to 1,200, Red.	100	4½%	4½%	4½%	4½%	99½—101½	99½—101½	..	..	..	4 8 8
17,000	Indo-European Telegraph	25	18 %	18 %	18 %	..	52 — 55	51 — 54	..	..	−1	6 18 11
$41,380,400	Mackay Companies Common	$100	2 %	3⅜%	4 %	4 %	74 — 78	74 — 78	..	..	..	5 2 7
$50,000,000	Do. do. 4% Cum. Pref.	$100	4 %	4 %	4 %	4 %	71 — 74	71 — 74	..	..	..	5 12 8
894,190	Marconi's Wireless Telegraph	1	Nil	Nil	Nil	..	⅜— ⅝	⅜— ⅝	16/6	15/3	..	Nil
72,680	Monte Video Telephone Co., Ltd. Ord.	1	5 %	6 %	6 %	6 %	3⅛— 3⅜	3⅛— 3⅜	..	..	..	6 0 9
86,492	Do. do. do. 5 % Pref. ..	1	5 %	5 %	5 %	5 %	3⅛— 3⅜	3⅛— 3⅜	..	..	−⅛	6 4 2
2,225,000	National Telephone, Pref. Stock	100	6 %	6 %	6 %	6 %	109 —111	109 —111	110½	109½	..	5 7 7
8,725,000	Do. do. Def. Stock	100	5 %	5 %	6 %	6 %	120 —124	122 —124	123½	122½	+1	4 16 9
15,000	Do. do. 6 % Cum. 1st. Pref.	10	6 %	6 %	6 %	6 %	10½— 11½	10½— 11½	..	..	..	5 6 8
15,000	Do. do. 6 % Cum. 2nd Pref.	10	6 %	5 %	6 %	6 %	10½— 11½	10½— 11½	..	..	..	5 6 8
250,000	Do. do. 5 % Non-cum. 3rd P., 1 to 250,000	5	5 %	5 %	5 %	5 %	5⅝— 5⅞	5⅝— 5⅞	5⅞	..	..	4 5 1
2,000,000	Do. do. 8½ % Deb. Stock Red. ..	Stock	8½%	8½%	8½%	8½%	97½— 99½	98 — 100	99	..	+ ½	8 10 0
1,716,598	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	99⅛—101½	99⅛—101½	100½	97⅞	..	3 18 10
179,813	Oriental Telep. and Elec. 1 to 171,504, fully paid ..	1	7 %	7 %	8 %	..	1½— 1⅝	1⅝— 1⅞	26/10½	26/3	−3⅛	5 17 8
60,000	Do. do. do. 6 % Cum. Pref... ..	1	6 %	6 %	6 %	..	1⅛— 1½	1⅛— 1½	22/6	..	..	4 16 0
99,100	Do. do. do. 4 % Red. Deb. Stock ..	100	4 %	4 %	4 %	4 %	88 — 90	88 — 90	..	..	..	4 8 11
99,400	Pacific & European Tel., 4 % Guar. Debs., 1 to 1,000	10	4 %	4 %	4 %	4 %	100 —102	100 —102	..	..	..	3 18 5
11,889‡	Reuter's	8	5 %	5 %	5 %	..	7½— 8¼	7½— 8¼	7⅝	..	..	4 17 7
99,100	Telephone Co. of Egypt, 4½ % Deb. Red.	100	4½%	4½%	4½%	4½%	98½—100½	99 —101	..	..	+ ½	4 9 1
8,083	Submarine Cables Trust	Cert.	6 %	6 %	6 %	6 %	127 —130	127 —130	..	..	..	4 12 4
120,000	United River Plate Telephone	5	8 %	8 %	8 %	..	6½— 7	6½— 7	6⅝	..	..	5 14 3
40,000	Do. 5 % Cum. Pref., Nos. 1 to 40,000	5	5 %	5 %	5 %	5 %	4½— 5⅜	4½— 5⅜	..	..	..	4 13 0
80,028	W. Coast of America, 1 to 80,000 & 53,001 to 53,028	2½	Nil	2½%	2½%	..	1½— 1⅝	1½— 1⅝	30/7½	..	..	3 11 5
150,000	Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel.	100	4 %	4 %	4 %	4 %	100 —102	100 —102	..	..	..	3 18 5
207,980	Western Telegraph, Ltd., Nos. 1 to 207,980.. ..	10	7 %	7 %	7 %	..	18 — 18½	18 — 18⅛	18⅝	18	..	5 8 8
800,000	Do. do. 4 % Deb. Stock Red. ..	100	4 %	4 %	4 %	4 %	101 —103	101 —103	102	..	..	3 17 8
88,321	West India and Panama Telegraph	10	Nil	Nil	Nil	Nil	⅛— ⅜	⅛— ⅜	9/6	..	..	Nil
84,568	Do. do. 6 % Cum. 1st Pref.	10	5 %	8 %	6 %	6 %	7⅞— 8⅛	7⅞— 8⅛	7⅞	..	+ ⅛	6 9 9
4,669	Do. do. 6 % Cum. 2nd Pref.	10	Nil	Nil	£2 6	..	7½— 8½	7½— 8½	..	..	..	2 14 1
80,000‡	Do. do. 5 % Debs., Nos. 1 to 1,800 ..	100	5 %	5 %	5 %	5 %	100 —102	100 —102	..	..	..	4 18 0

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.

550,000	Anglo-Argentine Trams, 10 % Nom. Cum. 2nd Pref., 360,008 to 550,007	5	8 %	8 %	9 %	..	8⅛— 9⅛	8⅛— 9⅛	9⅜	9	+ ⅛	4 12 11
360,007	Do. 6 % Cum. Prefs., 1 to 360,007 ..	5	5⅛%	5⅛%	5⅜%	..	6 — 6½	6 — 6½	6	..	..	4 12 0
966,600	Do. Permanent, 6 % Deb. Stock, 1888	100	6 %	6 %	6 %	6 %	137 —142	137 —142	..	..	..	4 4 6
285,100	Auckland E. Trams, 5 % 1st Mort. Deb. Stock ..	100	5 %	5 %	5 %	5 %	102 —104	102 —104	..	..	..	4 16 2
580,000	Babcock & Wilcox, 1 to 580,000	1	20 %	20 %	20 %	..	4½— 4⅝	4½— 4⅝	87/6	85/-	..	4 11 5
100,000	Do. do. 6 % Cum. Pref., 1 to 100,000 ..	1	6 %	6 %	6 %	6 %	1⅛— 1⅛	1⅛— 1⅛	..	..	..	3 18 10
60,000	British Aluminium, Ord., 1 to 40,000	5	7 %	7 %	7 %	..	1⅞— 2	1⅞— 2	34/-	32/6	..	17 10 0
60,000	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	7 %	3⅜— 3⅝	3⅜— 3⅝	68/9	65/9	..	8 12 5
40,100	Do. do. "A" 6 % Cum. Pref.	5	6 %	6 %	6 %	6 %	3½— 4½	3½— 4½	80/-	..	..	7 1 2
12,897	Do. do. 4 % Funding Certs.	5	4 %	4 %	4 %	4 %	3¼— 4½	3¼— 4½	..	..	..	4 8 11
124,400	Do. do. 5½ % Loch Leven Debs. ..	100	..	5½%	5½%	5½%	96 — 98	96 — 98	..	..	..	5 12 3
500,000	British Columbia E. Rail Def. Ord. Stock ..	100	6 %	6 %	8 %	8 %	136 —139	137 —140	137½	..	+1	5 14 4
400,000	Do. Pref. Ord. Stock	100	5 %	5 %	5 %	6 %	117 —121	118 —120	121	118½	+1	5 0 0
800,000	Do. 5 % Cum. Perp. Pref. Stock	100	5 %	5 %	5 %	5 %	104½—106½	104 —106	..	..	— ½	4 14 4
288,000	Do. 4½ % 1st Mort. Debs., 1 to 6,250	40	4½%	4½%	4½%	4½%	102½—104½	102½—104½	..	..	..	10 15 3
220,000	Do. 4½ % Vancouver Power Debs., 1 to 2,200	100	4½%	4½%	4½%	4½%	101 —104	101 —104	101	..	..	4 6 7
188,801	British Electric Traction	10	3 %	Nil	Nil	..	⅝— 1⅝	1⅛— 1⅛	..	..	−⅛	Nil
161,457	Do. do. 6 % Cum. Pref.	10	6 %	6 %	3 %	..	3⅝— 3¾	3¼— 3⅜	68/9	65/-	— ⅛	8 0 0
1,473,663	Do. do. 5 % Perp. Deb. Stock ..	Stock	5 %	5 %	5 %	5 %	90 — 95	90 — 95	92	90	..	5 5 8
528,936	Do. do. 4½ % 2nd Deb. Stock Red.	100	4½%	4½%	4½%	4½%	73 — 75	73 — 75	..	..	..	6 0 1
100,000	British Insulated and Helsby Cables	5	8 %	10 %	10 %	..	6⅝— 7⅛	6⅝— 7⅛	6⅝	6⅜	..	7 2 10
100,000	Do. do. 6 % Cum. Pref.	5	6 %	6 %	6 %	..	6⅛— 6⅜	6⅛— 6⅜	..	..	..	4 12 4
500,000	Do. do. 4½ % 1st Mort. Deb. Red...	100	4½%	4½%	4½%	4½%	104 —107	104 —107	..	..	..	4 4 1
208,440	British Thomson-Houston 4½ % 1st Mort. Debs. ..	100	4½%	4½%	4½%	4½%	90 — 95	88 — 93 xd	..	..	..	4 16 9
400,000	British Westinghouse 6 % Pref., 1 to 200,000 and 275,001 to 475,000	5	Nil	Nil	Nil	..	⅛— ⅜	⅛— ⅜	..	..	..	Nil
1,016,358	Do. do. 4 % Mort. Deb. Stock ..	100	4 %	4 %	4 %	..	42 — 47	40 — 45	..	..	−2	8 17 0
50,000	‡ Browett, Lindley & Co., Ord.	1	Nil	Nil	Nil	..	⅛— ¼	⅛— ¼	..	..	..	Nil
50,000	‡ Do. do. 6 % Cum. Pref.	1	Nil	Nil	Nil	..	14/6 to 15/6	14/6 to 15/6	..	..	..	Nil
140,976	Brush Electrical Engineering, Ord., 1 to 105,781 ..	2	2½%	Nil	Nil	..	0 — ¼	0 — ¼	..	..	..	Nil
200,000	Do. do. Non-cum. 6 % Pref.	2	6 %	Nil	Nil	..	⅛— ⅜	⅛— ⅜	..	..	..	Nil
125,000‡	Do. do. 4½ % Perp. Deb. Stock ..	Stock	4½%	4½%	4½%	..	59 — 64	57 — 62 xd	..	..	..	7 5 2
125,000‡	Do. do. 4½ % Perp. 2nd Deb. Stock..	Stock	4½%	4½%	4½%	..	38 — 42	38 — 42	..	..	..	10 14 4
187,610	Calcutta Trams, 1 to 187,610	5	8 %	8 %	6 %	..	4½— 5	4½— 5	95/-	..	..	6 0 0
45,304	Do. 5 % Cum. Pref., Nos. 1 to 29,880..	5	5 %	5 %	5 %	5 %	4½— 5½	4½— 5½	..	..	..	4 15 3
360,000	Do. 4½ % 1st Deb. Stock..	100	4½%	4½%	4½%	4½%	100 —103	100 —103	101	100	..	4 7 5
85,000	Callender's Cable Construction shares	5	15 %	15 %	15 %	..	9½— 10½	9½— 10½	9¾	..	..	7 6 4
40,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	..	5½— 5⅝	5½— 5⅝	..	..	..	4 6 11
300,000	Do. do. 4½ % 1st Mort. Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	105 —107	105 —107	106½	..	..	4 4 1
491,232	Cape E Trams., 1 to 491,232	1	Nil	Nil	Nil	..	⅛— ⅜	⅛— ⅜	..	..	..	Nil
450,000	Castner-Kellner Alkali, 1 to 450,000	1	6 %	8 %	12 %	..	1⅛— 1⅜	1⅛— 1⅜	32/9	32/9	..	7 10 1
210,158	Do. do. 4½ % 1st Mort. Deb. Stock	100	4½%	4½%	4½%	..	102 —106	103 —107	..	..	..	4 4 1
1,898,610	Central London Railway, Ord. Stock	Stock	4 %	4 %	3 %	3½%	63 — 65	63 — 65	64½	63½	..	5 3 2
558,195	Do. do. 4 % Pref. Stock	Stock	4 %	4 %	4 %	4 %	82 — 84	82 — 84	83½	82½	..	4 15 3
558,195	Do. do. Def. do.	Stock	4 %	4 %	2 %	2½%	45 — 47	45 — 47	..	..	..	5 2 0
1,460,000	City and South London Railway	Stock	1½%	2½%	2½%	1½%	27 — 28	26½— 27½	27½	27	— ½	5 9 1
85,000	Crompton & Co., Nos. 1 to 85,000	5	3½%	5 %	5 %	..	1⅛— 1⅜	1⅛— 1⅜	28/9	..	..	10 8 2
100,000‡	Do. 5 % 1st Mort. Reg. Debs., 1 to 900 of £100, and 901 to 11,000 of £50 Red.	..	5 %	5 %	5 %	5 %	96 — 99	96 — 99	..	..	..	1 0

* Unless otherwise stated, all shares are fully paid † A period of nine months. ‡ From Manchester Share List.

Continued on next page.

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.—(*Continued*)

Present Issue.	NAME.	Stock or Share.	Dividends for the last four years. 1905.	1906.	1907.	1908.	Closing Quotations Feb. 23rd.	Closing Quotations Mar. 2nd.	Business done week ended Mar. 2nd, 1909. Highest	Lowest.	Rise + or Fall —	Present Yield per cent.
		*										£ s. d.
260,000	Dick, Kerr & Co., 1 to 260,000	1	10 %	10 %	10 %	10 %	1½ — 1⅝	1½ — 1⅝	..	..	..	7 12 5
305,000	Do. do. 6 % Cum. Pref., 1 to 305,000 ..	1	6 %	6 %	6 %	6 %	1½ — 1½	1½ — 1½	23/9	..	..	4 16 0
276,880	Do. do. 4½ % Deb. Stock	100	4½%	4½%	4½%	4½%	100 —103	101 —104	..	..	+1	4 6 7
60,000	Dublin United Trams. (1896), 1 to 60,000	10	6 %	6 %	6¼%	6 %	11½ — 12½	11½ — 12½	..	..	..	4 18 0
60,000	Do. 6 % Pref. between 1 and 60,000	10	6 %	6 %	6 %	6 %	12½ — 13½	12½ — 13½	..	..	..	4 5 9
99,261	Edison & Swan Utd., "A" shs., £3 pd., 1 to 99,261	5	4½%	4½%	4½%	..	⅞ — 1	⅞ — 1	..	..	..	16 15 3
17,189	Do. "A" shares, 01—017,189 ..	5	4½%	4½%	4½%	..	1½ — 2⅛	1½ — 2⅛	..	..	..	8 6 9
317,875	Do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	75 — 78	75 — 78	..	..	..	5 2 7
67,720	Do. 5 % 2nd Deb. Stock Prov. Certs. all pd.	100	5 %	5 %	5 %	..	86 — 89	86 — 89	..	..	..	5 12 4
112,100	Electric Construction, 1 to 112,100	2	Nil	Nil	Nil	Nil	⅜ — ⅝	⅜ — ⅝	..	..	..	Nil
31,390	Do. do. 7 % Cum. Pref., 1 to 31,390..	2	7 %	7 %	7 %	7 %	1½ — 1⅝	1½ — 1⅝	..	..	..	9 6 9
25,000	General Electric Co. (1900), 5 % Cum. Pref. ..	10	5 %	5 %	5 %	..	7 — 7⅛	7 — 7⅛	..	..	..	6 13 4
200,000	Do. do 4 % Mort Deb... ..	Stock	4 %	4 %	4 %	4 %	85 — 89	85 — 89	..	..	..	4 9 11
78,000	Gt. N. & City Rail. Pref. Ord. "A" 4 %, 1 to 78,000	10	4 %	4 %	¼%	Nil	⅛ — ⅜	⅛ — ⅜	..	..	..	3 6 8
96,000	Greenwood & Bailey, 7 % Cum. Pref.	10	7 %	7 %	7 %	..	10½ — 10⅝	10½ — 10⅝	..	..	..	6 10 8
80,000	Do. do. 5 % Mort. Debs.	100	5 %	5 %	5 %	5 %	102 —103½	102 —103	..	..	..	4 16 10
40,000	Henley's (W. T.), Telegraph Works, Ord.	5	15%	15 %	15%	15 %	12 — 13	12 — 13	12⅜	12⅞	..	5 12 5
40,000	Do. do. 4½ % Pref.	5	4½%	4½%	4½%	4½%	5 — 5⅛	5 — 5⅛	..	..	..	4 1 10
150,000	Do. do. 4½ % Mort. Deb. Stock	Stock	4½%	4½%	4½%	4½%	105½—107½	106 —108	..	..	..	4 3 4
50,000	India-Rubber, Gutta-percha & Telegraph Works..	10	10%	10 %	10 %	..	15⅜ — 16½	15½ — 16½	..	..	..	6 1 8
37,500	†Liverpool Overhead Railway, Ord.	10	Nil	Nil	⅛	Nil	1 — 1⅛	1 — 1⅛	..	..	..	5 6 8
10,000	† Do. do. Pref., fully paid ..	10	5 %	5 %	5 %	5 %	4½ — 5½	4½ — 5½	..	..	..	9 10 6
600,070	London United Trams. (1901), 1 to 50,007	10	8 %	8 %	8 %	..	6½ — 6⅝	6½ — 6⅝	..	..	..	4 8 11
899,930	Do. do. 50,008 to 100,000	10	8 %	8 %	8 %	..	6½ — 6⅝	6½ — 6⅝	..	..	..	4 8 11
125,000	Do. do. 5 % Cum. Pref., 1 to 125,000 ..	10	5 %	5 %	5 %	..	4 — 4½	4 — 4½	..	..	..	11 2 2
1,331,000	Do. do. 4 % 1st Mort. Deb. Stock ..	100	4 %	4 %	..	4 %	73 — 77	78 — 77	77	76	..	5 3 11
5,732,062	Metropolitan Consolidated	100	2⅜%	1 %	⅛%	⅛%	35½ — 36½	85½ — 86½	85⅞	85⅜	..	1 7 5
2,640,914	Do. Surplus Lands	100	2⅜%	2⅜%	2⅜%	2⅜%	69 — 71	69 — 71	70	69	..	3 17 6
3,235,000	Do. District	100	Nil	Nil	Nil	Nil	13⅜ — 14½	13⅜ — 14½	14½	..	..	Nil
814,016	Metropolitan Electric Trams., Defd...	1	Nil	Nil	Nil	..	3/32 — 5/32	3/32 — 5/32	..	..	..	Nil
600,000	Do. do. 5 % Cum. Pref. ..	1	5 %	5 %	5 %	..	23/32 — 25/32	23/32 — 25/32	15/3	..	..	5 19 5
600,000	Do. do. 4½ % Deb. Stock Red.	100	4½%	4½%	4½%	4½%	93 — 96	93 — 96	94⅜	93	..	4 13 9
$6,000,000	Mexico Trams Co., Common Stock	..	..	..	..	..	186½—188½	185—187	186⅞	188	—1½	..
$9,000,000	Do. 1st Mort. 50-year 5% Gld. Bds.	..	..	..	..	5 %	93½ — 94⅛	90½ — 91½	94	90½	— 3	5 9 3
245,500	Potteries E. Trc.	1	4 %	4 %	4 %	..	3/32 — 5/32	3/32 — 5/32	..	..	..	8 0 0
245,500	Do. 5 % Cum. Pref.	1	5 %	5 %	5 %	..	3/32 — 5/32	3/32 — 5/32	..	..	..	6 17 11
245,000	Do. 4½ % Deb. Stock	100	4½%	4½%	4½%	4½%	89 — 92	89 — 92	..	..	..	4 17 10
37,350	Telegraph Construction and Maintenance	12	15 %	15 %	17½%	15 %	32½ — 34½	32 — 34	32	..	..	5 14 10
150,000	Do. 4 % Deb. Bds., 1 to 1,500 Red., 1909	100	4 %	4 %	4 %	4 %	100 —102	100 —102	..	..	..	3 18 5
1,000,000	Underground Electric Railway, 5% Prior Lien ..	..	..	..	..	..	98½ — 99½	98½ — 99½	99½	99	..	..
2,800,000	Do. do. 4½% Bonds	..	..	..	..	4½%	81 — 83	81 — 83	81½	..	..	5 9 9
4,900,000	Do. do. 6% Income Bonds	..	..	..	..	..	29 — 31	29 — 31	..	..	..	..
66,666	Willans & Robinson, 1 to 30,000 & 80,001 to 116,666	1	Nil	Nil	10 %	..	2⅝ — 2¾	2⅝ — 2¾	..	..	..	10 0 0
66,666	Do. 6 % C.P., 30,001 to 80,000 & 125,001 to 141,666	5	Nil	..	6 %	..	2⅝ — 2¾	2⅝ — 2¾	..	..	..	10 8 8
246,404	Do. 4 % 1st Mort. Deb. Stock		4 %	4 %	4 %	4 %	68 — 72	68 — 72	..	..	..	5 11 1

ELECTRICITY SUPPLY COMPANIES.

15,000	Bromley (Kent) E.L. & P., 1 to 15,000		5⅛%	5⅛%	5⅛%	..	4½ — 5	4½ — 5	..	..	..	5 10 0
70,000	Do. do. 4½ % 1st. deb. stock ..	100	4½%	4½%	4½%	4½%	94 — 98	94 — 98	..	..	..	4 10 0
30,275	Brompton & Kens. Elec. Lt. Sup., Ord., 1 to 20,000	5	10 %	10%	10 %	10 %	8½ — 8⅝	8½ — 8⅝	..	..	..	5 14 3
9,725	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	7 %	8 — 8½	8 — 8½	..	..	..	4 2 4
886,876	Central Electric Supply 4 % Guar. Deb. Stock ..	100	4 %	4 %	4 %	4 %	98 —101	98 — 101	..	..	..	3 19 3
80,000	Charing Cross and Strand Electricity Supply ..	5	5 %	5 %	5 %	5 %	4⅛ — 4⅜	4⅛ — 4⅜xd	85/-	..	..	5 5 3
80,000	Do. do. do. 4½ % Cum. Pref.	5	4½%	4½%	4½%	4½%	4⅜ — 4⅝	4⅜ — 4⅝	86/3	..	..	4 17 4
80,000	Do. "City Undertaking" 4½ % Cum. Pri.	5	4½%	4½%	4½%	4½%	3⅝ — 4⅛	3⅝ — 4⅛	76/3	75/-	..	5 9 1
445,736	Do. do. 4 % Deb. Stock Red. ..	100	4 %	4 %	4 %	4 %	96 — 98	96 — 98	..	..	..	4 1 8
49,436	Chelsea Electricity Supply, Ord.	5	6 %	4½%	4½%	4½%	3⅞ — 4⅛	3⅞ — 4⅛	77/6	75/7½	..	5 5 11
175,000	Do. do. 4½ % Deb. Stock Red. ..	Stock	4½%	4½%	4½%	4½%	102 —105	102 —105	104½	103½	..	4 5 9
70,595	City of London Elec. Lighting, Ord. 40,001—110,595	10	6 %	6 %	6 %	6 %	10⅜ — 11½	10⅜ — 11½	11	10½	..	5 6 8
40,000	Do. 6 % Cum. Pref., 1 to 40,000	10	6 %	6 %	6 %	6 %	12 — 12⅝	12 — 12⅝	12½	12⅜	..	4 14 1
400,000	Do. 5 % Db. Stk., Scrip. (iss. at 115) all pd.		5 %	5 %	5 %	5 %	121 —123	121 —123	..	..	..	4 1 4
800,000	Do. 4½ % 2nd. Db. Stk., Prov. Crts., all pd.	100	4½%	4½%	4½%	4½%	99 —102	99 —102	101½	..	..	4 8 3
50,000	County of Durham Electrical Power, Ord.	5	4 %	4 %	2 %	..	2⅝ — 3	2⅝ — 3	..	..	..	3 6 8
50,000	Do. do. do. 5 % Pref. ..	5	5 %	5 %	5 %	..	3½ — 3⅝	3½ — 3⅝	..	..	..	6 13 4
220,000	Do. do. do. 5 % 1st Mtg. Deb.	Stock	..	..	..	5 %	96 — 98	96 — 98	..	..	..	..
40,000	County of London Electric Lighting, Ord. 1—40,000	10	5 %	5 %	5 %	5 %	8⅞ — 9⅛	8⅞ — 9⅛	..	..	..	5 8 1
50,997	Do. do. 6 % Pref., 40,001—60,000	10	6 %	6 %	6 %	6 %	10⅞ — 11⅛	10⅞ — 11⅛	11	10⅛	..	5 6 8
400,000	Do. do. 4½ % Deb. Stock ..	..	4½%	4½%	4½%	4½%	105 —108	105 —108	106½	105	..	4 3 4
400,000	Do. do. 4½ % 2nd. Deb. Stock ..	Stock	4½%	4½%	4½%	4½%	100 —103	100 —103	102½	..	..	4 7 5
80,000	Edmundson's Electric Corporation, Ord. Shares ..	5	4 %	Nil	Nil	Nil	1/32 — 3/32	1/32 — 3/32	..	..	..	Nil
80,000	Do. do. 6 % Cum. Pref.	5	6 %	3 %	Nil	Nil	1/32 — 3/32	1/32 — 3/32	..	..	..	Nil
480,500	Do. do. 4½ % 1st Mort. Deb. Stk.	100	4½%	4½%	4½%	4½%	59 — 62	59 — 62	..	..	..	7 0 8
$8,150,000	Electrical Dev.Co.of Ontario, 5% 1stMtg.Gold Bnds.	$500	..	..	..	..	85 — 87	82½ — 84½ xd	..	..	..	..
10,000	Folkestone, 1 to 10,000	5	5⅛%	5⅛%	5⅛%	..	4½ — 5	4½ — 5	..	..	..	5 10 0
10,000	Do. 5 % Cum. Pref., 1 to 10,000	5	5 %	5 %	5 %	..	5 — 5½	5 — 5½	..	..	..	4 10 0
90,000	Do. 4½ % 1st Deb. Stock	100	4½%	4½%	4½%	4½%	95 — 98	95 — 98	..	..	..	4 11 10
15,000	Hove, 1 to 15,000	5	9 %	9 %	8¾%	8¾%	6½ — 7	6½ — 7	6⅞	6⅝	..	6 1 5
$2,400,000	Kaministiquia Power Co., 5 % Gold Bnds.	..	..	..	..	5 %	96½ — 98½	96½ — 98½	97⅝	..	..	5 0 0
21,000	Kensington and Knightsbridge Electric Ord. ..	5	10 %	10 %	10 %	8 %	7⅝ — 8⅛	7⅝ — 8	7 1/16	..	— ¼	6 1 3
90,000	Do. do. do. 4 % Deben. Stk.	Stock	4 %	4 %	4 %	4 %	93 — 96	93 — 96	..	..	..	4 0 0
111,000	London Electric Supply Corporation, Limited, Ord.	3	4 %	4 %	2½%	3 %	1⅜ — 2⅛	1⅜ — 2⅛	41/3	..	+ ⅛	4 16 0
70,000	Do. do. do 6 % Pref. ..	5	6 %	6 %	6 %	6 %	4⅞ — 5⅛	5 — 5⅛	5⅛	5 1/16	+ 1/16	5 11 8
874,395	Do. do. 4 % 1st Mort. Deb. Stk. Red.	Stock	4 %	4½%	4½%	4 %	91 — 95	92 — 96	..	..	+ 1	4 3 4
200,000	Metropolitan Electric Supply, 1 to 100,000	5	10 %	8 %	6¼%	5 %	4⅝ — 5⅛	4⅝ — 5⅛	100/-	95/-	..	6 3 10
76,121	Do. 4½ % Cum. Pref. 1—71,106	5	4½%	4½%	4½%	4½%	4⅝ — 5⅛	4⅝ — 5	96/3	93/9	..	4 10 0
230,000	Do. 4½ % 1st Mort. Deben. Stock ..	..	4½%	4½%	4½%	4½%	106 —109	106 —109	..	..	..	4 2 7
345,000	Do. 3½ % Mort. Deben. Stock Redem.	Stock	3½%	3½%	3½%	3½%	85 — 88	85 — 88	..	..	..	3 19 7
$6,000,000	Mexican Electric Light Co., 5% 1st Mtg. Gold Bnds		5 %	5 %	5 %	5 %	86½ — 87½	86 — 87	86½	85⅞	— ⅛	5 14 11
12,686,000	Do. Light and Power Co., Ltd., Common ..	$100	..	..	..	3½%	78 — 80	75½ — 76½	78	73⅜	—3	4 11 6
$1,500,000	Do. do. 7% Cum. Pref. Stk.	Stock	..	..	..	7 %	110 —112	109 —111	109⅜	..	—1	6 6 2
$12,000,000	Do. do. 5% 1st Mtg. Gold Bnds.	..	..	..	..	5 %	89 — 90	89½ — 90½	89⅞	89	+ ⅛	5 10 6
250,000	Midland Electric Corporation, 4½ % 1st Mort. Deb.	100	4½%	4½%	4½%	4½%	95 — 98	95 — 98	..	..	..	4 11 10
87,500	Newcastle-on-Tyne, 1 to 87,500..	5	8 %	8 %	8 %	..	3⅞ — 4⅛	3⅞ — 4⅛	..	..	— ⅛	9 8 3
87,500	Do. 5 % Pref., 1 to 87,500	5	5 %	5 %	5 %	..	5 — 5⅛	5 — 5⅛	..	..	..	4 10 11
126,500	North Metropolitan Electric Power Supply Co., 5 % Mortgages (Red.), Nos. 1 to 1,265	100	..	..	..	..	100 —102	100 —102	..	..	..	..
10,852	Notting Hill Electric Lighting	10	7½%	7½%	7½%	7 %	11⅛ — 12⅛	11⅛ — 12⅛	11⅜	11⅛	..	6 5 0
20,000	Oxford, 1 to 96 and 407 to 20,510	5	7 %	7 %	7 %	..	5⅝ — 6⅜	5⅝ — 6⅜	..	..	..	5 9 10
50,000	Do. 4 % Deb. Stock	100	4 %	4 %	4 %	4 %	94 — 97	94 — 97	..	..	..	4 1 8
119,694	River Plate Elcty. Co. Ord. Nos. 1 to 120,507 ..	1	..	2½%	..	..	1 1/16 — 1 1/8	1 1/16 — 1 1/8	24/9	..	..	..
100,000	Do. do. 6% Non Cum. Pref. Nos. 1 to 100,000	1	6	6	6	..	1 3/16 — 1 5/16	1 3/16 — 1 5/16	..	..	..	5 14 3
194,684	Do. do. 5% Deb. Stk. Red.	100	5	5	..	5 %	100 —103	100 —103	..	..	..	4 17 1
40,000	St. James' and Pall Mall Electric Light, Ord. ..	5	12½%	10 %	10 %	10 %	8⅜ — 8¾	8⅜ — 8⅝ xd	8 1/16	8¼	..	5 12 6
20,000	Do. do. 7 % Pref. 20,001 to 40,000	5	7 %	7 %	7 %	7 %	6¾ — 7⅛	6⅝ — 7⅛ xd	..	..	..	4 16 7
160,000	Do. do. 3½ % Deb. Stock Red. ..	100	3 %	3½%	3½%	3½%	86 — 90	86 — 90	..	..	..	3 17 9
12,000	Smithfield Markets Electric Supply, Ord.	5	4 %	Nil	Nil	..	1/16 — 1/8	1/16 — 1/8	..	..	..	Nil
46,700	Do. do. do. 4 % Deb. Stock	Stock	4 %	4 %	4 %	4 %	63 — 70	63 — 70	52/6	..	..	5 11 1
65,300	South London Electricity Supply, Ord.	4	4 %	3 %	4 %	..	2⅜ — 2⅝	2⅜ — 2⅝	..	..	..	6 10 4
120,000	South Met. Elec. Lt. & Power, Ord.	1	2½%	2½%	2½%	2½%	⅜ — ⅝	⅜ — ⅝	9/-	..	..	4 0 0
142,968	Do. do. 7 % Pref.	1	7 %	7 %	7 %	7 %	1⅛ — 1⅜	1⅛ — 1⅜	23/9	..	..	5 12 0
220,000	Do. do. 4½ % 1st Deb. Stk.	100	4½%	4½%	4½%	4½%	101 —104	101 —104	..	..	..	4 6 7
80,000	Urban Electric Supply, Ord.	5	5 %	5 %	5 %	..	⅞ — 1	⅞ — 1	..	..	..	20 0 0
60,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	..	1⅝ — 2	1⅝ — 2	..	..	..	12 10 0
275,000	Do. do. 4½ % 1st Mort. Db. Stk. Red.	100	4½%	4½%	4½%	4½%	80 — 83	77 — 81	79	..	—2½	5 11 1
808,000	Victoria Falls Power Co., Pref. Nos. 1 to 800,000 ..	1	..	..	..	..	⅛ — 1	¼ — 1	18/3	..	— 3/32	..
110,000	Westminster Electric Supply, Ord.	5	18 %	12 %	10 %	10 %	8⅜ — 8⅞	8⅜ — 8⅞	8 13/16	8½	..	5 12 8
81,979	Do. do. 4½ % Cum. Pref. Reduced from 5% since 31st Dec., 1905)	5	5 %	4½%	4½%	4½%	5⅛ — 5½	5⅛ — 5½	5⅜	5 1/16	..	4 1 10

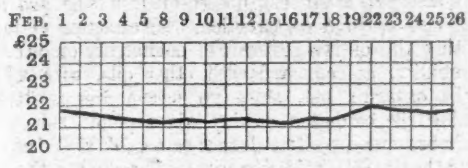
* Unless otherwise stated, all shares are fully paid. † Quotations on Liverpool Stock Exchange. Interim Dividend.

Bank rate of Discount, 3 per cent., January 14th, 1909

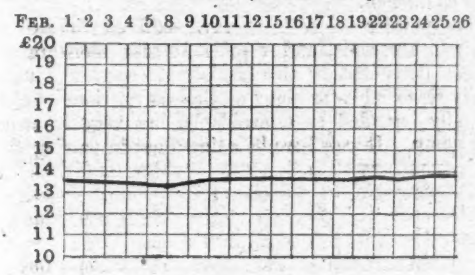
METAL MARKET.

Fluctuations in February.

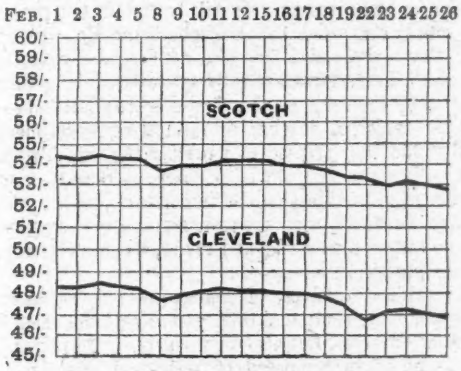
SPELTER (G.O.B's.).



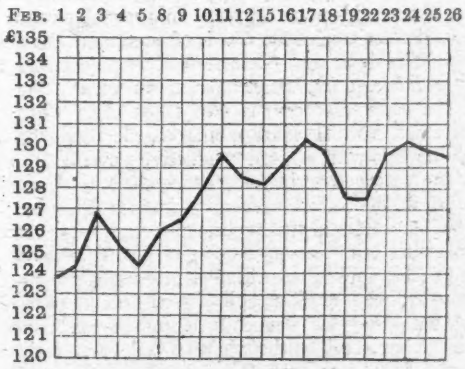
LEAD (ENGLISH).



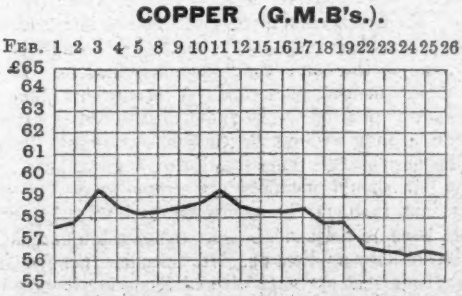
IRON.



TIN.



COPPER (G.M.B's.).



Electric Lighting.—The Board of Trade has refused the application of the Farnham and District Electric Lighting Co. for permission to erect overhead wires in carrying out the order to light the town by electricity.

SUPPLY BY METER, OR CONTRACT?

By W. A. TOPPIN, A.M.I.E.E.

With the larger consumers of electricity this question is at once settled in favour of metering the supply, as the amount of profit received from them renders the expense of a good meter a question of little importance. When we come to the small consumer, however, it is quite another matter. There have been many schemes brought forward recently for wiring cottage property or tenements in such a cheap manner as to bring the first cost of the electric light down to a figure that this class of consumer can afford. Unless the supply authority can reduce the cost of the service cables, cut-outs and meters per consumer, or come to some contract arrangement with him that will give lasting satisfaction to both parties, thus saving the cost of meters, these wiring schemes are of little use.

It is essential if meters are used that they should be accurate at the smallest loads that occur in practice, and fortunately the cheapest meters on the market at present are also the most accurate at these loads. Only on rare occasions will these consumers have more than a 30-c.p. lamp burning at one time, and with metallic-filament lamps used with ordinary pressures, this means a very small current. An actual case met with in practice will show the importance of this point. A small house fitted with four lights had the energy used measured until recently by means of a modern type mercury meter, and the average annual consumption was 27 B.T.U. An electrolytic meter was installed, and the registered consumption was trebled or quadrupled, although the method of using, number, and candle-power of the lamps remained the same as before. The old meter brought in was tested and found to be correct at four amperes (a load at which it was never worked) and started with an 8-c.p. lamp. The percentage error using a 16 or 32-c.p. lamp was found to be very great. A large number of cases similar to this in a town would have a serious effect on the profits. It is very doubtful if prepayment meters are worth considering for the class of consumer we are dealing with, *i.e.*, from two to six lights per house. They are necessarily more expensive than ordinary meters, and give more trouble to the meter staff.

Let us now consider the way in which this problem has been attacked by those supply authorities that desire to dispense with meters. The general tendency has been to charge a fixed sum per quarter per lamp installed. This is open to the following objection. A consumer receives an account for, say, 10s. for a June quarter, when he has used the light very little, and compares it with the 10s. he paid for the March quarter, when he used it much more. It appears unreasonable to him, and cases have been known where consumers have refused to pay their accounts, and have discontinued the use of the light purely on these grounds. Suppose now, that for each of his summer quarters his account had been 5s., and 15s. for each of the winter quarters, he would have paid the same amount as before to the supply authority and without complaint, as the accounts would resemble the old days when he used gas.

There seems to be a large difference of opinion as to whether the lamps should be supplied by the supply authority or by the consumer. In some cases where the lamps are supplied to the consumer, the lampholders are sealed so as to prevent him from inserting lamps taking more current and so defrauding the authority.

Where the lamps are provided by the consumer, the supply authority rely upon the cost of renewals preventing the consumer from using his light extravagantly. The most suitable plan seems to be for the consumer to have to pay for renewing worn-out lamps himself, but to be obliged to obtain the lamps from the supply authority, who could either keep a special shape of lamp in stock for the purpose, or have a special mark on the lamps to ensure that the condition is complied with. They could at the commencement of the scheme supply cheap carbon-filament lamps, and later on, when success had caused the mains to be overloaded, start supplying metallic-filament lamps of the same candle-power but taking less current, thus relieving the mains, and make a slight reduction in the charge for energy to the consumer to

compensate him for the higher price he has had to pay for the new kind of lamp.

It has been proposed to install a current limiter in each house so that if the householder endeavours to defraud the supply company by taking more current from the mains than he is entitled to, the supply shall either be cut off or interfered with in some way. If the supply is continuous throughout the year this device does not prevent the company from being defrauded; as long as the householder does not exceed his current limit, he can use the energy day and night for some purpose or other. There would also be the tendency for the device to get neglected and useless. The company's representative would call each quarter, collect the account and hurry away. The apparatus would require examining quarterly to see if it had been tampered with and tested on overload to see if it would still act all right.

Another point on which authorities differ is as to whether the supply should be absolutely continuous throughout the year, or whether it should be limited to the hours of darkness only. Where fogs are not prevalent, and the latter method is therefore possible, there is undoubtedly less opportunity for fraud. To sum up, wherever it is at all possible meters should be used in each house. There is the minimum possibility of fraud, and the individual habits of the householders receive fair treatment. One householder may be of very economical habits or frequently away from home, whilst another may have a house full of lodgers and may have to use all the lights in the house every evening. Under any contract system these cases would each get a similar quarterly account.

Where it has been decided to adopt some contract system the following arrangements would be found to give satisfaction to both parties:—Accounts to be higher in winter than in summer, paid quarterly (to save the large expense of collecting the accounts more frequently) and paid in advance, in order to avoid losses due to consumers leaving before the end of a quarter.

Lamps to be paid for by the consumer and obtainable only from the supply authority with some distinguishing mark on them. This, amongst other advantages, ensures the consumer getting a satisfactory article.

In districts free from fog a supply to be given during the hours of darkness only, a current limiter or a light fuse in a sealed case being used to prevent fraud. In places where fogs are frequent, a cheap type of meter to be fixed to measure the total amount of energy used by a row of cottages or tenement. The readings of these meters to be taken quarterly, and inquiries made where an excessive amount of energy has been registered. This would enable a fraudulent consumer to be quickly detected. In all contract systems, unless special precautions are taken against fraud, the dishonest consumers are likely to spoil the success of the scheme.

THE LINSEED OIL FALLACY.

[COMMUNICATED.]

Amongst the comprehensive group of materials of construction there is probably no subject upon which recorded information is more indefinite than in the case of insulation. This fact is the more surprising, in view of the extreme importance of such materials, not only directly to the manufacturer, but also indirectly to those responsible for the efficient running of electrical plant. In these days of keen competition, therefore—when reliability must not, on any account, be sacrificed to cheapness—no apology is needed for a brief consideration of at least one important feature of the subject.

In the construction of dynamos, motors, and transformers, linseed oil has been used, up to the present, almost universally in some form or another; but signs are not now wanting that those responsible for its use are at last paying attention to facts which varnish chemists have known for many years. It must be admitted that the high initial resistance of linseed oil has attracted many engineers, regardless of its subsequent behaviour, but no doubt to many the suggestion has occurred of so heating it that it would effectively exclude moisture, and thus maintain its original value as an insulating medium.

At this point, however, the experience of varnish and paint manufacturers becomes of vital importance from an electrical point of view, and modifies the engineer's orthodox, and yet tacitly assumed, belief that linseed oil is a *sine quâ non* in motor and dynamo construction. As a matter of fact, we find that this oil is a commercial commodity on account of the rapidity, as compared with other oils, with which it absorbs oxygen; but, since no means are available for arresting the oxidation at any given point, this characteristic becomes a positive danger as regards electrical work; for, by the time the oxidising process is complete, the linseed oil has been converted into a brittle powder known sometimes as *linoxyn*.

This powder—that is to say, oxidised linseed oil—is highly hygroscopic, and rapidly absorbs moisture to the obvious detriment of the insulation, being, no doubt, ultimately responsible for many of those mysterious breakdowns generally regarded as unavoidable, but vaguely associated with damp. It may here be pointed out in passing that an ordinary well-ventilated motor provides conditions exceedingly favourable to its own subsequent destruction, and facilitates by its high temperature and intense oxidation the degradation of its linseed oil insulation.

As an illustration of the above remarks, one has only to observe the fine dust upon interior mural decorations which were painted, say, twelve months ago with linseed oil as a medium for the pigment. It will be found that the oil has been totally destroyed by atmospheric action, and that on foggy days, the walls, in spite of fires, are covered with moisture. These facts are fully appreciated by painters, as is shown by the issue of the *Decorator* for December 22nd, 1908, in which a number of interesting experiments are recorded for the purpose of proving the worthlessness of linseed oil when subjected to damp. Surely, since the question is of at least equal importance to the electrical industry, it would well repay engineers to investigate the matter in their own works and revise, where necessary, their existing practice.

The subject involves, of course, not only cloths impregnated with linseed oil and used extensively for slot linings and other purposes, but also oil varnishes. In fact, with the latter, which are composed of resin-acid gums melted in linseed oil and thinned with turpentine and naphtha, an additional evil is incurred owing to the well-known chemical action of the acids upon copper. In a machine returned for repairs, discoloration of the wire is often noticed, but although this is obviously a sign of imperfect treatment, the former policy of *laissez faire, laissez aller*, is continued. This action upon the copper, of course, also takes place when quick-drying spirit varnishes are employed, the result being that a metallic salt with a good conductivity eventually impregnates the cotton covering of the conductor. The original moisture in the cotton itself, not properly dried out before varnishing, assists in this process and aggravates the evil.

It is therefore necessary to employ a compound which not only can be applied at a sufficiently high temperature to drive out all the initial moisture in the cotton covering, but which will also seal, chemically as well as mechanically, all pores. Linseed oil—although used very extensively for this purpose—is, as we have found, useless on account of its oxidation, and therefore it behoves manufacturers to look further afield for something more nearly approaching the ideal. This ideal substance should be thoroughly waterproof, and at the same time extremely flexible. It should have a high melting point and yet be capable of automatically sealing up a fault. It should withstand repeated heating and cooling without brittleness. It should be incombustible and at the same time have a good heat conductivity. It should not deteriorate when exposed to air, and at all times it should be unaffected by lubricating oils. It should have no deleterious effect upon cotton and should be capable of easy application. Its specific gravity should be greater than that of water without rendering it inconvenient to manufacture or handle. Above all, of course, it should have a high enough dielectric strength, and the market price should not be prohibitive.

If a substance fulfilling these conditions were employed intelligently, electrical manufacturers would not only improve

the reliability of their machines, but would simplify winding shop practice to a considerable extent. The writer has in mind, when considering the features of the ideal insulation, a substance which could be used :—

1. To impregnate cotton-covered wires at a temperature considerably above the boiling point of water.

2. In the form of a narrow tape with great tensile strength for armature coils, &c.

3. In sheet form for slot linings, transformer coils, &c., and—

4. In conjunction with a harmless solvent, as an insulating paint for preventing leakage on switchboards, and other exposed surfaces.

With such an insulating medium as this, the prolonged processes of drying, varnishing, and baking, with which we are only too familiar at present, would be obviated, and we should have a corresponding reduction in works' costs, together with a quicker delivery of completed machines.

THE COMPANIES' CLAUSES ACTS.

By JOS. I. H. STANSFIELD, F.C.I.S.

From a perusal of the various Power Acts which have become law during the last few years, it will be seen that they incorporate the Companies' Clauses Acts, these Acts governing the position of the shareholders, debenture stock holders, and others who are responsible for the capital necessary to bring the Power Companies into active being.

In many respects these Acts vary from the Companies' Acts under which most companies—electrical and otherwise—hold their legal status, and some of the more interesting of these differences are mentioned in the following article.

There are so many companies registered under the Companies' Acts, 1862 to 1907, that one may excusably be under the impression that the Companies' Act, of 1862, was the first Act passed to enable bodies of persons to form themselves into companies having a limited liability, but this Act only formed a stepping stone in the progress of company legislation, for it was in 1845 that the Legislature took in hand the systemisation of several important departments of company law, the Companies' Clauses Consolidation Act, 1845, being one of a group of Clauses Consolidation Acts which received the Royal Assent in that year, the others being the Lands Clauses Consolidation Act and the Railway Clauses Consolidation Act, whilst somewhat similar Acts were also legalised and made applicable to Scotland.

Even the Clauses Act of 1845 was not the first case of a Consolidation Act being passed, as in the forty-first year of the reign of George the Third (44 years before), a Consolidation Act applying to Inclosures was passed, but the various Acts passed in 1845 seemed to have whetted the appetite of Parliament, for in 1847 Consolidation Acts were passed relating to markets and fairs, gasworks, bodies of commissioners, waterworks, harbours, docks and piers, towns' improvement, cemeteries, and town police, truly a formidable lists of enactments, thereby showing a fine taste for this class of Parliamentary food.

The Companies' Act, 1862, was the forerunner of a considerable number of supplementary and amending Acts, fully 25 Acts having been passed since then, and if all goes well, we are this year to have another amending Act to allow Colonial companies to hold land in this country with less difficulty, together with a voluminous charter codifying the many Acts passed from 1862 to the present time. The Clauses Act passed in 1845 has, however, stood the test of time very well, as in a period of over 50 years, only four amending or supplementary Acts have been passed, one of these being only to amend a clerical error made in its predecessor.

It must not, however, be assumed that this difference has arisen entirely because the legislators of 1845 were more far-seeing than those of 1862. The Act of 1845 may be wholly or partly incorporated with the provisions contained in special Acts which are necessary where Parliamentary powers are required to carry out an undertaking affecting public rights, and in such cases the provisions contained in the Clauses Consolidation Act are more or less modified, being, in effect, an alteration of the law applicable to statutory companies.

A perusal of the two sets of Acts, and a comparison of their respective provisions, show very clearly that the Act of 1862 was, in the main, founded on the Clauses Act of 1845, but was so drawn as to facilitate the incorporation of public companies and render unnecessary the cumbrous and expensive method appertaining to the promotion of a Parliamentary company. In the case of the latter Act greater ease of working is obtained by the provisions of Table "A" being easily altered where special circumstances render it advisable, whilst, on the other hand, the majority of these regulations are included in the provisions of the Companies' Clauses Consolidation Act, and can only be altered by means of a special Act.

It is interesting to those who may hold, or be appointed to hold, the position of secretary to find that that position is frequently referred to in the earlier Act, the word, however, also including that of clerk, as this latter officer frequently held the position and carried out the duties now taken by the secretary. The position of treasurer (should such an officer be necessary) is also nowadays frequently held by the secretary. Whilst the secretary under the Companies' Acts, 1862, *et seq.* has many opportunities to become personally liable for penalties for personal breach of the many provisions in those Acts for which a penalty may be enforced, he has no personal liability for damages chargeable to the company. It is not so, however, in the case of the treasurer of a company incorporating the Clauses Act, 1845, as by Sec. 143 of that Act, if sufficient goods of the company cannot be found whereon to levy any damages, costs or expenses, payable by the company, the same may, if not exceeding the sum of £20, be recovered by distress of the goods of the treasurer of the company, provided, however, that the said treasurer may retain the amount paid out of any sums of the company he may have or sue the company for the amount. Similar provisions will be found in the Lands Clauses Act, 1845 (Sec. 136 *et seq.*) and the Railways Clauses Act, 1845 (Sec. 140 *et seq.*), truly a roundabout method of enforcing a penalty and a somewhat unpleasant one for the officer in question.

Some of the most important differences between the two Acts are to be found in the method of dealing with the transfer and transmission of shares and the statistical books required. Instead of the register of members necessitated under Sec. 25 of the Act of 1862, two books are required in the case of companies incorporating the Clauses Act of 1845, one a register of shareholders and the other a shareholders' address book, only the latter book being open to the inspection of members, out of which copies may be required to be taken by the company at the rate of 100 words for 6d.

There have been many attempts to modify the conditions requiring a list of members to be annually sent to the Registrar of Joint Stock Companies, under Sec. 26 of the Companies' Act, 1862. No doubt this has its uses at times, but it is difficult to remember this and to cease to regret the waste of time in getting out the ofttimes voluminous list. The tendency is, however, to make these requirements more exacting, but it is interesting, and to the secretary of such a company consoling, to find that no such list is required from companies acting under the Consolidation Acts, the authentication of the register of members by affixing the Common Seal of the company at each ordinary meeting of the company taking its place.

The provisions as to transfer of shares are also somewhat different under the older Act, as it is the duty of the secretary upon the delivery of the transfer deed to enter a memorial thereof in the register of transfers, to endorse such entry on the deed of transfer, and on demand deliver a new share certificate, or at the request of the purchaser to endorse the old certificate instead of issuing a new one. In practice this latter is, however, seldom required, and the more modern method of issuing a new certificate to every transferee is generally followed. Sec. 11 of the Act of 1845 states that on demand of the holder of any share the company shall cause a certificate of the proprietorship of

such share to be delivered to the shareholder, and as no mention was made of a collective certificate, it was quite customary to issue a separate certificate for each share, and this custom was often followed in the case of companies incorporated under the Act of 1862. No doubt many who have been concerned with such companies will have had the tiresome experience of endorsing a large number of share certificates when a transfer has taken place, and will have taken the first available opportunity to make a welcome alteration to the up-to-date method of one certificate for the whole of the shares transferred to one purchaser.

The provisions with respect to a transmission of shares in consequence of death, bankruptcy or insolvency, or in consequence of the marriage of a female shareholder or by any lawful means other than a transfer, state that the transmission must be authenticated by a declaration in writing. Every such declaration must state the manner in which and the party to whom the share has been transmitted and must be made and signed by some credible person before a Justice. Upon the declaration being left with the secretary he must thereupon enter the name of the person entitled under the transmission in the register of shareholders, for which entry the company may charge the sum of 5s., and until such transmission has been so authenticated, no person claiming by virtue of any such transmission may vote or become entitled to any profits of the undertaking. In addition to this, other evidences of title, such as the probate of the will in the case of death, &c., can be demanded.

In the case of a transmission in consequence of the marriage of a female shareholder, the particulars required in the declaration must include the identification of the wife with the registered holder. Although this is not necessary in the cases of other transmissions it is frequently included in the form required by the company. This inclusion has caused some little difficulty with the Inland Revenue authorities. Under Sec. 21 of the first schedule to the Stamp Act, 1891, an impressed stamp of 2s. 6d. is required in the case of affidavits and statutory declarations, but there is an exemption where these are required by law. It is held by the Board of Inland Revenue that, as the identification just mentioned is in excess of the requirements of the Clauses Act with respect to transmissions other than those arising through marriage, the declaration must be stamped. Under the Section referred to, the affidavit has to be sworn before a Justice of the Peace, but, by the Finance Act, 1907, this limitation has been withdrawn.

The requirement in the Companies' Act, of 1862, to add the word "Limited" to the name in cases where a limited liability is desired, has become so well known that it is often overlooked that there may be other companies with the same privilege. There can be no question that, in a prospectus, the omission of this word in new companies incorporated under the Clauses Consolidation Acts may have a deterrent effect on would-be subscribers, the impression being created in some minds that this protection of limited liability is not afforded in such companies. In this connection Sec. 36 of the Clauses Act, 1845, is of supreme importance, as in this section is contained the provision that in case of any execution against the property or effects of the company, and if there cannot be found sufficient goods whereon to levy execution, the liability of the shareholder is limited to the extent of the shares respectively held in the company *not then paid up*. There is the peculiarity, however, that the execution may be issued by the Court against one or more shareholders, instead of against the company.

(*To be concluded.*)

PROCEEDINGS OF INSTITUTIONS.

The Kapp-Hopkinson Test on a Single Direct-Current Machine.

By Dr. W. Lulofs.

(*Abstract of paper read before the* Institution of Electrical Engineers *at Birmingham, February 10th*, 1909.)

The Kapp-Hopkinson, or circulation-of-power test, is the most accurate method for finding the efficiency of two similar machines.

The object of the following is to point out how the test may be applied to a single lap-wound direct-current machine only, providing it is not supplied with Mordey equalising connections. The test as described was carried out on a four-pole machine, but the principle of this test holds equally good for any machine having more than four poles.

The principle is as follows:—The two positive as well as the two negative brushes are disconnected, and two ammeters, A_1 and A_2, of equal range inserted in, say, the two negative leads (see fig. 1), whilst the positive brushes are short-circuited through an ammeter A_3. Should now the exciting current of the two south poles so be altered that the excitation of S_{A1} is strengthened by the same amount as that of S_{B1} is weakened, then a difference of potential must be obtained between the two positive brushes when the armature rotates. As S_{A1} is strengthened by the same amount as S_{B1} is weakened, the two south poles may be considered to have retained their former strength, and to have superposed over them a field dependent on the magnitude of this alteration, and in the direction S_{B1}, S_{A1}.

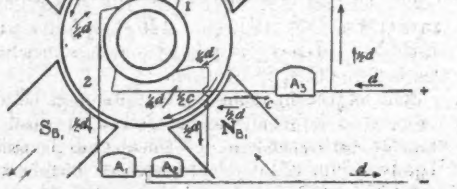


Fig. 1.

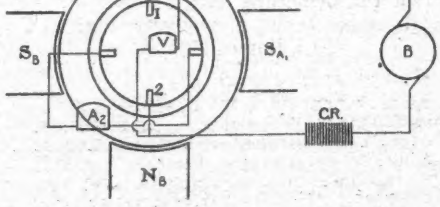


Fig. 2.

The difference of potential so obtained between the positive brushes 1 and 2 will give rise to a current which flows in the two halves of the armature; this current flows down under S_{A1}, up under S_{B2}, and mixed up and down under N_{A1} and N_{B1}.

The armature ampere-turns produce a field which lies in the direction N_{B1}, N_{A1}, so an alteration of S_{A1}, S_{B1} in the way described inevitably involves an alteration of the north poles, strengthening N_{B_1} by the same amount as N_{A_1} is weakened. The armature, however, revolves in this field, built up by its own ampere-turns, and for this reason a potential difference must be created between the two negative brushes, tending to make the current flow downwards under N_{A_1}, upwards under N_{B_1}, and mixed up and down under S_{A_1} and S_{B_1}. These armature ampere-turns in their turn excite a field over the two south poles in the direction S_{A1}, S_{B_1}; that is, in the opposite direction to the alteration originally produced, or, in short:—The armature reaction of a lap-wound machine will tend to prevent a circulating current from flowing from one brush to the other of equal potential.

In order to enable a circulating current to flow, say, from positive brush 1 to positive brush 2, the armature reaction in direction N_{B1}, N_{A1} must be counterbalanced. This can easily be done in the same way as the original alteration of the south pole fields is obtained. This circulating current, which now leaves the positive brush under S_{B1}, flows through the ammeter A_3, and is measured by the same, and, flowing back to the armature in positive brush under S_{A1}, divides equally in the two halves of the armature. The magnitude of this current is dependent on the magnitude of alteration given to S_{A1}, S_{B1}, and the armature reaction produced by itself. As already explained, the armature reaction gives rise to a current leaving the armature at, say, brush 4, flowing through ammeters A_1 and A_2 back into armature through brush 3, and counteracts the alteration given to S_{A1}, S_{B1}. This second circulating current is, therefore, a disturbing element, and must be done away with in the way already explained, and the two ammeters A_1 and A_2 showing no deflection indicate that this condition is obtained.

In order to run the armature at its normal speed it is not necessary to drive it mechanically. On connecting the two armature terminals as usual to the normal voltage supply, and giving the fields the normal excitation, the machine can be started up in the ordinary way as motor running light, and its speed can be adjusted by the voltage impressed on field or armature.

A_1, A_2, and A_3 will all read half the running-light current, and the sum of A_1 and A_2 multiplied by the voltage impressed gives the power which the machine consumes running light. (The field watts are not considered.) The circulating current can now be obtained in the above-mentioned way, and A_3 will read double the value of the circulating current in the actual armature bars + or − half the running-light current, whereas A_1 and A_2 are kept indicating like currents by totally counterbalancing the armature reaction. Hence the current divides in the armature as shown in fig. 1. That part of the armature under south pole S_{A1} carries current $\frac{1}{2}c + \frac{1}{2}d$, and working under the stronger pole acts, therefore, as the motoring half. The opposite part carries $\frac{1}{2}c - \frac{1}{2}d$, *i.e.*, the smaller current, and acting under the smaller field works as dynamo. Two losses are not expressed in these results, namely, brushes 3 and 4 carry no circulating current; secondly, the poles N_{A1} and N_{B1} are not distorted by the armature current flowing under them, so that to the losses these have to be added separately. The calculation of these losses is very simple.

Another test is shown in fig. 2. Send from auxiliary machine B a current, say, in at brush 1 and out at brush 2. Ammeter A_1 measures this current, and, by means of the carbon rheostat C R, or changing the pressure of B, it is adjusted to half the full-load current. The poles are normally excited, but current A_1 exerts no torque. By strengthening N_A, weakening N_B, and at the same time counterbalancing the armature reaction of A_1 so far till A_3 also reads half the full-load current, the full-load running conditions are obtained, and the product of volts V and amperes A_1 give at once the full-load loss which occurs in the machine.

The only difference to the load condition is that in every other armature bar double the current flows, while the other bars are free from current. These big current values cannot hurt the machine, as the bars carrying double load and no load continually change conditions. As the general direction of this current is down under N_{A1}, up under N_{B1}, down under S_{A1}, up under S_{B1}, only a torque can be exerted in changing the pole strength of two opposite poles, in this case N_A N_B.

The values of the efficiency obtained by both methods tally fairly well for full-load condition.

In a lap-wound machine the current divides fairly equally in the armature at all magnitudes of excitation, even when the armature is appreciably out of centre.

The Use of Large Gas Engines for Generating Electric Power.

By Leonard Andrews, M.I.E.E., and Reginald Porter, B.A., A.M.I.E.E.

Discussion at London.

The discussion was opened by Mr. W. B. Woodhouse, who had to admit that the authors had advanced almost convincing arguments in favour of the use of the gas engine. They were all agreed as to the improved thermal efficiency of the gas engine, but he did not think the authors wished the comparative coal consumptions, which they tabulated, to be taken seriously. He did not agree that steam plant would necessarily pay as much as 12s. per ton for coal, nor that the producer plant would prove satisfactory with coal at that figure. The producer, as was well known, was not easy to operate, and great care had to be exercised in choosing coal, or trouble ensued; it was, therefore, fair to assume that special fuel would be required. It was important to make clean gas, and this involved a great deal of plant, which must be in duplicate. Moreover, a producer would not stand forcing if it was required to get the ammonia. The figure given for water in the case of the steam plant was excessive; and as regarded the size of the steam station, if this were larger, with larger units, the comparison would be much more favourable to the turbine as the gas engine was limited in size at the present time. Doubling the steam plant capacity would only mean a 50 per cent. increase in cost. As regards the actual station shown, he would prefer seven 30,000-lb. boilers in preference to twenty 10,000-lb. ones, with twenty little economisers; this would cost less. Moreover, the cooling towers were not necessary, and for the capitalised cost of the water supply as given, a favourable site could have been obtained. A reduction in the estimate for water, larger turbine units and reduced buildings would bring the total expenditure on the steam plant to £105,000, and he finally arrived at a cost per unit with steam of ·456d., as against ·47d. for gas, made up as follows:—

	Steam.	*Gas.*
Fuel, net cost	0·228	0·079
Repairs	0·050	0·100
Wages and stores	0·034	0·051
Interest, &c., at 12 per cent. ...	0·144	0·240
Total	0·456d.	0·470d.

This figure for gas was higher than that of the authors, owing to his having assumed the repairs of the gas plant to be just double those of the steam plant.

Mr. R. A. Chattock thought the overload capacities of generators as now made did not agree with the overload capacities of the prime movers as given by the authors. He considered that the gas engine plant would require considerably more repairs, and its first cost was excessive compared with steam. The engine repairs might not be serious, but those of the producer plant would be heavy.

Mr. E. J. Fox criticised the authors' lay-out of the steam station, which did not give the turbine a chance. As regarded overload capacity, he considered that experience had shown the advantage of using an alternator of 50 or 100 per cent. greater output than that of the turbine in normal working, with a view to taking advantage of its overload capacity. At West Ham during the last two years the coal had gone down 2 lb. per kw.-hour, due, he considered, to the flexibility of the turbines in use; one 2,000-kw. set at West Ham generated over 9 million units last year, and he considered that the authors' estimate of five such units to produce 21 million units was excessive. By putting in four 2,500-kw. steam turbines with machines for continuous 50 per cent. overloads, and otherwise modifying the design, the steam plant ought not to cost more than £100,000. He could not agree that the labour costs in the case of steam engine plant would be as much as for the gas engine plant, nor that the repairs in the latter case would be as light as in the case of the turbines. Actually, on 200,000 h.p. of turbine plant, over a period of four years, the cost per kw. per year for repairs had been less than 6d. on the average; on this basis the repairs to the turbine units would be nearer £250 than the £4,000 given by the authors. He considered, moreover, that 5 per cent. depreciation was too little in the case of either plant, as it would pay to throw out plant much sooner than was usually done, say in 10 years. The fact that the small gas engine would work as economically as the large one was, he considered, the best testimony against the use of large gas engines.

Mr. P. R. Allen said it would be observed that the authors proposed to work half the plant with ammonia recovery and the other half without, but it was by no means certain that it would not be advantageous to put down rather larger producers in the first instance and work them all with ammonia recovery. A 13 ft. 6 in. Mond producer would comfortably gasify 24 tons of slack in 24 hours and allow of a recovery of 95 lb. of sulphate of ammonia per ton of fuel, providing the coal originally contained 1·3 per cent. nitrogen. Allowing that only half this amount were recovered, still the value of the sulphate obtained would soon cover the extra cost of the recovery plant. The relative calorific value of the gas when worked with recovery and without recovery could be taken as 140-145 B.Th.U. per cb. ft. with recovery and 150-165 without recovery, and a fair-sized producer could be worked over a wide range without sacrificing much in efficiency. A producer normally dealing with 24 tons per day could be dropped to 6 tons without much impoverishing the gas and without any detriment to the ammonia yield. On the other hand, if the producer were forced, the ammonia fell off, but the value of the gas increased. The speaker preferred to divide the eight producers into two groups of four each, capable of being worked independently, and having two distinct services of pipe mains, so that any engine could be fed from either of the systems; the blower installations for each group should be in duplicate also. Continuity of working with a large gas plant depended on being able to keep the pressure up even if a considerable external leak developed, and water lutes should be made as deep as possible, so as to minimise the chance of blowing in case the pressure was unexpectedly increased. Arrangements should be made so that the blowers, the compressors for starting with air and the lighting dynamos could be driven by steam, which was necessary if the producers were worked as one group. The Snow Pump Co.'s engines in the California power station gave 5,400 h.p. in four cylinders arranged twin tandem, and in Germany some of the makers building Körting engines were now getting 2,000 h.p. in one cylinder. On the question of upkeep and repairs and renewals, the speaker said that a steam plant having an output of 25,000,000 kw.-hours, during one year cost £45 per week on repairs to the boilers, economisers, condensing plant and auxiliaries; but after changing over to gas, the repairs to producers, recovery plant and accessories were reduced to £15 a week, saving about £1,500 a year. The speaker had had two two-cycle gas engines of 700 h.p. each working almost continuously for the past six years, and the output kept up as good as when they were started. In a gas engine installation care should be taken that the windings of the generators were very carefully insulated in the first instance, as whatever might be said to the contrary the atmosphere of a gas engine station tended to injure ordinary insulation. The capital cost of £17·68 per kw. installed was almost exactly the same as some figures obtained quite independently last year from some very close tenders for a 10,000-kw. gas plant, and it was obvious that with a little rearrangement those prices could have been reduced to £17 per kw. installed. He was inclined to think that the labour costs were estimated somewhat on the low side; and no provision was made for the supervision of a chemist. At Weston Point all the producers and recovery plant were worked under the direction of a chemist, and this plant was one of the two Mond installations where the highest ammonia results were obtained. After making comparisons between the figures given by the authors and those that were actually available from gas-driven stations, he was inclined to believe that the estimated cost of running would be about realised. With a gas plant, only about half the fuel would be used as compared to a steam plant, and with an ammonia recovery plant a valuable fertiliser was produced which reduced the cost of fuel 2s. 6d. per ton.

Mr. H. A. Humphrey said that fifteen years ago no maker would guarantee a dynamo to work with a gas engine, owing to the spasmodic working of the latter. The many difficulties of those days had been overcome, and he had successfully used gas engines in 100, 450 and 600 h.p. units in connection with plants, which had since been exclusively extended with gas engines. He considered that cyclic irregularity was the chief reason for the non-

adoption of gas engines in many stations. Electrical engineers required to be familiar with the turning moment curves of engines at both full and half loads, as from them various essential data could be obtained, some notes and curves in connection with which he submitted to the Institution. The steam turbine had chiefly won over the gas engine, owing to its low first cost, cyclic regularity and elasticity; but when the steam boiler and condenser were considered, their efficiency was very low, and they constituted the sources of loss. The producer was superior to the steam boiler on all points; it was easier to work, more efficient, less dangerous, &c., and the only limit to its overload capacity was the point when the fuel was lifted off the grate by the steam and air which were being blown through. As regards the cost of fuel, the South Staffordshire Mond Gas Co. had used 28,952 tons of fuel at an average cost of 6s. 9d. per ton, including all charges into the bunkers. The calorific value of this fuel was 12,000 B.TH.U. per ton, and he did not think suitable boiler fuel could be purchased at that figure. This gas plant had never failed to supply, day or night, during the past four years, and the gas was so easily cleaned that no trace of solid matter was found in their extensive mileage of underground mains. He considered that the ideal power plant was a combination of gas engines and steam turbines.

Mr. J. S. Highfield considered it a mistake to apply the gas engine to very large stations at present, owing to the lack of knowledge of them, and the fact that the manufacturers were still feeling their way with them. Where cheap fuel was available, he regarded it as absurd to run risks when good steam plant was available, but under certain conditions, such as in large chemical works, &c., and where the cost of coal was a dominating factor, the gas engine must be considered. The gas engine should only be used in conjunction with other plant in central stations and on continuous load. In this connection it appeared from data in his possession that in London, as a whole, one-tenth of the plant installed took 40 per cent. of the output, and half of the plant took only 7 per cent. of the output. It was difficult to get men used to gas-driven plant, and it should only be used with discrimination.

Mr. Sehmer (Ehrhardt & Sehmer) said that the engines now being built had a 10 per cent. continuous overload capacity, and would give much more for two hours. He had not had much experience with the producer, but his experiments for 10 months with a producer plant using coal dust, were very satisfactory. He considered 12s. per ton for producer coal as much too high a price, and one of his own engines, he knew, was running on fuel at 6s. per ton. As regards the possible development in size of cylinder, his firm had been building several engines with 1,600 B.H.P. per cylinder, and had now decided to construct a twin-tandem engine of 8,000 B.H.P., requiring 2,000 B.H.P. per cylinder. On the question of repairs, estimated by the authors, he would be prepared to guarantee costs of £2,000 to £2,500 for repairs to the whole plant. The first cost of gas plant was undoubtedly high, but some return must be allowed for the initial pioneering work; the first cost, however, was coming down rapidly, and he considered the authors' figures too high.

Prof. R. Threlfall did not agree that 90 lb. of sulphate of ammonia per ton of coal would be obtained from fuel at 12s. per ton, nor that anyone would pay so much as that. Bituminous fuel for producer work must be selected for satisfactory working results. He considered that the authors had taken the repairs to the gas plant (engines and producers) at the lowest possible figure, from his experience. It was an exceptional thing, and not the rule, to make long non-stop runs with the gas engine, and accounts of such runs had done the gas engine much harm. The gas engine, however, was now a commercial machine, despite possible trouble with cylinders, piston rods and stuffing boxes.

Mr. J. E. Dowson regretted the inability of British builders to accept the responsibility for building larger gas engine units than 1,000 H.P., and advised engineers not to accept larger units than those at present. He was glad that attention had been directed to the standby loss in steam plant, which was a very important item.

Mr. A. M. Taylor said that the steam consumption diagram given by the authors, taken in conjunction with the average coal consumption, 3½ lb., for the tabulated stations, showed clearly the large proportion which standby and other losses represented. He wondered whether the authors had considered the use of storage batteries in connection with their designs, as he calculated that it was possible to omit generating plant and add batteries with a saving in capital of £36,000 and an annual saving in coal of 2,600 tons. This would, moreover, provide for the full loading and, therefore, efficient working of the gas engines, and relieve them of possible overloads.

Mr. G. L. Addenbrooke had considered the question of the gas engine for generating station work, but thought a difficulty was met with when working producers on low loads. It was often necessary to work at half loads in the early stages of development. He considered that the authors had placed the capital cost of the steam plant too high, and the conditions assumed were much against it. The diagram showing the steam consumptions, no-load losses, &c., was very useful; he believed that there was room for at least 25 per cent. economy over the best practice of the present day. The gas engine was coming into use, and where fuel was expensive, engineers were justified in trying it.

Mr. W. H. Booth referred to his early experience with the gas engine, and likened the attitude of the British engineer to the latter, to that of the countryman who, after examining the profile of a dromedary in the Zoo, remarked to himself "Taint so." On examining an early gas engine 30 years ago, he had been assured that it represented finality; later he underwent the same experience when being shown a 16-H.P. Crossley engine. The gas engine was, however, still developing, but much more rapidly in Germany than in this country, owing to the utilisation of blast furnace gas there.

Mr. J. B. Robinson did not think the British position in the matter had been fairly shown. Some six years ago his firm had started building 600-H.P. engines, and now they had ten engines of over 1,000 H.P. running. Although he favoured the gas plant, his firm were interested in both types of plant, and it was only fair to say that they would reduce the authors' price of £13 10s. per KW. for steam plant as arranged to £12 10s., or without cooling towers to £11 16s. per KW., and this made the total cost of the steam plant much less, while the price of the gas plant appeared about right. He agreed with earlier speakers in regard to the advantage of combining the gas engine and steam turbine in power plants. From published data, it appeared that Messrs. John Cockerill had generated some 24 million units from 8,400 H.P. of gas engines during one year, the load factor being 50 per cent., and the total works cost amounting to ·016d. per unit. It was calculated that if the load factor were reduced to 25 per cent., the cost would only be increased to ·116d. per unit. Judging by the above results, the authors' figures for gas-generating plant should be increased about 10 per cent. for their load factor, and even then the gas engine justified its use.

Mr. B. Stewart said he considered that the authors' figures for capital cost in the case of the gas-generating plant were on the high side. The greater part of the trouble experienced over here with gas engines had been due to dirty gas, but now, judging from the performance of his firm's engines, too much importance was attached to this matter. He considered that the authors had overstated the cost of repairs to the gas plant; a 1,500-H.P. single-cylinder engine of their own, cost £119 for repairs over a year, and this included two half-yearly overhauls, which were usual as far as his firm was concerned. Similarly a 500-H.P. engine had cost £91 over 12 months. The repairs to gas plant (on the ammonia recovery system) judging by his experience, would be slightly in excess of the amount mentioned by Mr. Allen; in Scotland their fuel, "double nuts," was costing 7s. 1½d. per ton, and they obtained an average of 84 lb. of ammonium sulphate per ton. The double nuts were not essential though, as during the recent colliery trouble, they had used anything they could get. The British gas engine had got a bad name, owing to the producer troubles, which, of course, did not occur in Germany, where blast furnace gas was almost always employed.

Mr. W. Dixon, taking up the last speaker's remarks, pointed out that German steel works were invariably coupled to blast furnaces, which gave an incentive to develop the power from the gas. Here the conditions were otherwise, and hence we had had no reason to develop the large gas engine as in Germany. From his experience, under conditions of long working hours and with a plant large enough to use the ammonia recovery system, the engineer could have his coal bill cancelled, and there were no districts where it was not possible to get suitable coal at from 7s. to 9s. per ton. During the past three or four years his firm had installed the equivalent of 140,000 H.P. of ammonia plant, and of this, some 9,800 H.P. was used in conjunction with gas engines; in all cases the ammonia products were more than paying for the coal.

Mr. Leonard Andrews, owing to the lateness of the hour, decided to communicate his reply. He, however, commented on the extreme difficulty of obtaining any information from British gas engine makers; and the difficulty of understanding Mr. Highfield's attitude on the gas engine. He thought that Mr. A. M. Taylor's proposals were well worth considering.

Discussion at Manchester.

Mr. C. E. Douglas said he was a keen believer in the gas engine, both in its present and its future. The turbine had a considerable place in large towns, where land was very expensive, but having regard to the development of high-tension transmission, it was a simple matter to put large generating stations a little further out, where waste land could be more readily obtained. The figures for the coal consumption given by Messrs. Andrews and Porter, were a very fair average indeed for both steam and gas engines. Comparing the capital cost of the two sets of plant, his opinion was that the steam installation was practically on a par with the gas installation. He thought a discrepancy factor of 25 per cent. was not enough. With regard to interest and depreciation, the Lancashire and Yorkshire mill owner would not agree to anything under 10 per cent. He believed there was a big field for gas engine work in the South of England and the London district, where coal was expensive.

Mr. S. L. Pearce confessed that he was not able to seriously shake the figures that the authors had put forward. The question really resolved itself into two factors, heavier capital expenditure on the one hand, against reduced fuel costs. The fuel cost was dependent upon the price per ton, and also on the load factor of the station, the two determining factors in coming to a decision on this question. He was inclined to think that Mr. Andrews's view in October, 1907, in which he advocated a combination of gas plant with steam plant, was a sounder view than that which he took up now, in which he apparently plumped for gas plants at stations which had a very low load factor. The station engineer, in considering the question of prime movers, would naturally have in view three points: reliability, capital outlay, and fuel economy. He was prepared to say that the large gas engine unit to-day was thoroughly reliable. With regard to the producer end, they had unfortunately very little experience. Engineers who were considering the question of gas plants would like to have more information, and to be more actually satisfied that the producer was as satisfactory as the gas engine itself. The capital cost of the steam plant appeared to him to be about 10 per cent. too high. The capital

costs for a gas plant using 5,000-K.V.A. units could probably be bought down to £15 per KW. As to fuel economy, Mr. Andrews stated that various tests of gas engines of different outputs showed a figure of 1 lb. per KW.-hour. That figure did not appear to be borne out in practice. He had had some figures put before him some time ago by a firm of gas engine builders, and although they were considering conditions in which the size of unit was some 4,000 KW., and in which the load factor would be at least 70 per cent., the guaranteed figures worked out at about 1¾ lb., so that this figure, 1 lb. of coal per unit generated, was on the low side, when considering the conditions that the authors had taken in the first part of their paper. He considered 1½ lb. to be nearer the mark. With regard to by-products the authors stated the figure at £11, and that was very near the mark, but if the supply of by-products was likely to become extensive, was not the price going to fall? The stand-by coal figures that the authors gave—4·48 lb. per hour per plant unit—agreed with his own experience. The authors gave data for a 6,000-KW. turbo-alternator at Stuart Street station, Manchester; the figure of 15,000 lb. was incorrect, it should really be 9,500. Of course, that was against the steam turbine, because if the no-load losses were decreased and they still had a total consumption of 95,000 lb., that meant that the coal consumption per actual unit generated was higher. That very likely explained why the overall thermo-dynamic efficiency of 7·4 in steam plant was higher than the authors thought it should be. The authors had taken a very extravagant figure for the cooling water per hour, no less than 70 times the weight of steam condensed. His experience went to show that the turbo-alternators were likely to cost far less in upkeep than reciprocating low-speed sets. Regarding the question of depreciation and interest, 10 per cent. was too high and 6½ per cent. too low. He would suggest a figure of 8½ per cent. for gas and steam.

Mr. W. Stead said that at the Westinghouse works they had about 1,200 B.H.P. of gas engines, and the remainder were reciprocating steam engines. If for any purpose the gas engines were shut down, they very soon felt it in the coal bill. Their producers had been at work for about four years; they were of the Mond type, of 1,000 H.P. each. In that time they had relined them both; the relining cost about £75 each, and that was the only repair made. The only trouble in a producer was the tar, and this had been a very great evil. A Liverpool firm had produced a burner for tar; 23 cwt. of tar would take the place of a ton of coal. He knew of a mill where a Westinghouse gas engine was running on 1·2 lb. of coal per B.H.P. The H.P. was about 750, and the coal was 1s. 6d. per ton cheaper than that which one would supply to a corresponding Lancashire boiler, used for driving the weaving sheds.

Dr. F. H. Bowman agreed that with very cheap fuel, a good supply of water and very large power, the steam engine held an equal chance with the gas engine. He held that the gas engine was not as perfect as the producer—especially the continuous action suction producer. If the by-products could not be sold in the form mentioned, there were other things that they could be utilised for. The great advantage of the gas engine was, that they obtained in small powers, say up to 1,000 H.P., a greater economy than they could possibly do with a steam engine, at a less cost. If a suction producer was put down for, say, 500 H.P., the plant would cost less than £1 per H.P. There was absolutely nothing to get wrong, and the suction-gas plant was the best to use up to this power.

Mr. S. J. Watson said that large generating stations requiring cooling towers were the exception. The towers made a considerable difference in the capital expenditure. The authors omitted any reference to the cost of the land and the cost of the site on which the buildings stood. He had carefully gone through the figures, and thought that £117,500 would not be an impossible figure for a station of the size given, supposing that an ample water supply was available, which worked out to about £11·15 per kilowatt, compared with the authors' figures of £13 9s. Adding the cost of buildings, the cost would be something like £18 per kilowatt; in many instances a cheaper quality of fuel could be used for the boilers, as compared with a producer. With 24 per cent. load factor, the cost could be made practically identical, and with half the load factor, the steam plant had the advantage.

Mr. V. A. H. M'Cowen said there were a number of figures which he disagreed with. The average cost of coal taken over the preceding five years came out at something like 8s. per ton in that district. That would benefit the steam scheme by about £3,500 a year. Sixpence per 1,000 gallons of water was a most excessive figure; in that district it was possible to get it at possibly a sixth of the price by bore holes. That would reduce the cost of water in the case of the steam scheme from £2,500 to about £330, and in the gas scheme to about £90. The cooling towers were quite unnecessary. The authors had taken very small boiler units; he did not see any reason why their capacity should not be doubled, and this would reduce the capital outlay on the boilers, reduce the radiation losses and also reduce the space. The discrepancy factor was much too large. The space taken for the steam scheme might be reduced at least 25 per cent. by rearrangement of the plant.

Mr. J. Atkinson emphasied the fact that the average overall efficiency of gas plant was more than twice as great as that of steam plant. It appeared to him that the lower the load factor, the greater the need for gas engines, it being much easier to keep gas producers shut down than steam boilers. His experience, when working engines with different kinds of gas, had been that dust caused more trouble and difficulty than hydrogen.

The Authors, in their reply, said they were convinced that the large saving in fuel, in labour and maintenance, and recovery of by-products, would enable large gas engine units in central public supply stations to compete with small isolated plants. Of course, if central station engineers omitted to avail themselves of the high thermal efficiency of the gas engine, industrial users would then find it cheaper to generate their own current in isolated small plants. They agreed with Mr. Pearce that combined gas and steam stations would be largely used in future, because steam plants were already installed in the majority of supply stations, and these would be retained for the peak load, gas engines being used for the flat portion of the curve. But in laying out a new station there was no advantage in installing combined plants. Mr. Pearce had overlooked the fact that 1 lb. of fuel per KW. generated by gas engines was the fuel for ex'ra current only. Their estimate of the total consumption was 2·18 lb., which was considerably higher than actual consumptions recorded. It had been found practicable to use coal, so inferior that it did not pay for cartage from the pit's mouth, for generating producer gas and recovering sulphate of ammonia. Mr. Watson estimated the capital cost of the steam plant at £11·5 per KW., excluding land and buildings; their own estimate, excluding these items, but including cooling towers, was £10·6 per KW. The figure for gas plant repairs, upon which they had based their estimates, was 60 per cent. greater than the figure which gas-engine makers assured them their previous experience enabled them to guarantee. Sixpence per 1,000 gallons was the common charge for town water supply; whether it would pay to sink a bore hole would depend entirely upon local conditions. Numbers of large gas engines were running on coke-oven gas, which was a much more difficult problem than working on producer gas. Their estimate of gas fuel consumption was more than confirmed by the records from eight actual producer gas engine installations.

Discussion at Dublin.

Mr. J. Sturgeon practically agreed with the conclusions arrived at, but differed from the authors regarding the size of gas engine proposed. English makers had not had experience in anything above 500 KW. He had an engine suitable to drive a 500-KW. three-phase alternator, which cost, complete with alternator, £6,520, while a similar set, of 1,000-KW. capacity, cost £13,300, so that the capital cost per kilowatt was slightly higher for the larger plant. The Central Ireland Power Co. proposed to use peat as fuel; such a plant manufacturing sulphate of ammonia could produce power at exceedingly low rates; in fact, it had been calculated that it would prove economical at times, when the demand for power was small, to continue gas making, blowing the gas away or burning it. The quantity of ammonium sulphate produced per ton of coal was 90 lb., and with one ton of dry peat, 112 lb.

Mr. G. M. Harris mentioned that the large National 500-KW. plant, which ran for several months side by side with four steam sets at the Irish International Exhibition, was put on full load the first night it was running, and ran through the whole of the time of the Exhibition without a hitch. It was frequently over loaded, but ran as well, and was as reliable as the steam sets.

Mr. W. J. Sowter was a little disappointed with the authors' conclusions; he believed that if they had taken the case of a plant for a few hundred kilowatts only, the use of gas in place of steam could have been shown to afford a great saving. He had recently obtained quotations for high-speed gas-driven sets, and the cost came out practically the same as for steam, allowing for condensing plant, flues, chimney stack, &c. In small stations, the cost of fuel was very high—frequently from 8 to 10 lb. of coal per unit, if the running plant load factor was bad—while it had been shown by the authors that the fuel consumption per unit was practically the same for gas-driven plant, no matter what the size of the plant. It would require an exceedingly bold engineer to put down an 8,000-KW. gas-driven station straight away.

Mr. W. Tatlow said that the conditions at Johannesburg were probably quite unique, and he did not consider that because that particular scheme had proved a failure, all confidence in gas engines should be lost. The authors had been rather unfair in assuming the cost of repairs to gas engines and turbines to be equal. He was surprised that gas engine makers had not attempted to utilise the Diesel cycle in gas engines, as the explosions were so much less violent and there were no ignition troubles to contend with.

Mr. T. Tomlinson said that the question of fuel consumption was, in large stations, much more important than in small ones, because in large stations the cost of fuel was frequently 80 per cent. of the total cost of generating current. He thought that the peat scheme mentioned by Mr. Sturgeon would prove to be entirely successful and of great benefit to Ireland. He would like to know how the authors got overload capacity with gas engines.

Mr. P. A. Stewart said it was curious that one never heard the subject of gas engine driving discussed without the production of sulphate of ammonia being dragged in. If these large power plants were started all over the country, the price of sulphate of ammonia would drop and the cost of sulphuric acid increase.

Mr. J. Sturgeon explained that sulphate of ammonia was £7 per ton before Dr. Mond made his first gas plant. As the output increased its value became better known, and instead of the price falling it rose to £12 per ton, and the average price last year was £11 15s. 8d.

Mr. A. T. Kinsey mentioned that a small supply station in Ireland, driven by suction gas, was selling energy at 3d. per unit, whereas a neighbouring station driven by water power charged 5d.

Mr. G. F. Pilditch, in closing the discussion, remarked that gas engines would soon be running steam engines very close, although their capital cost seemed to be higher. He would have anticipated that the cost of repairs to gas engines would have been greater than to steam engines.

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

New Rubber Washing Machine.

Messrs. Werner, Pfleiderer & Perkins, Ltd, of Peterborough, are putting on the market an entirely new type of machine for the washing of rubber, gutta-percha and balata, which has proved very succes-ful, several machines having now been in daily use for more than 18 months. It consists of two deeply corrugated or indented rolls, which revolve towards one another, but do not intersect. These rolls are carried in a trough, the bottom of which is shaped to correspond with the shape of the rolls. Into the front and back walls of the trough, gratings are fitted, which permit the washing-water to flow into a jacket surrounding the trough; removable gauze-covered frames are placed over the inner sides of these gratings, and prevent the escape into the jacket of any large particles.

The jacket is equipped with several outlets, so that the level of the water can be varied during the washing process. Thus it is possible to run the water off as soon as it has passed once through the contents, or to keep the level up to the top of the rolls, or to wash entirely under water by keeping the level over the top of the trough up to overflow gutters carried along near the top on the inner walls of the jacket.

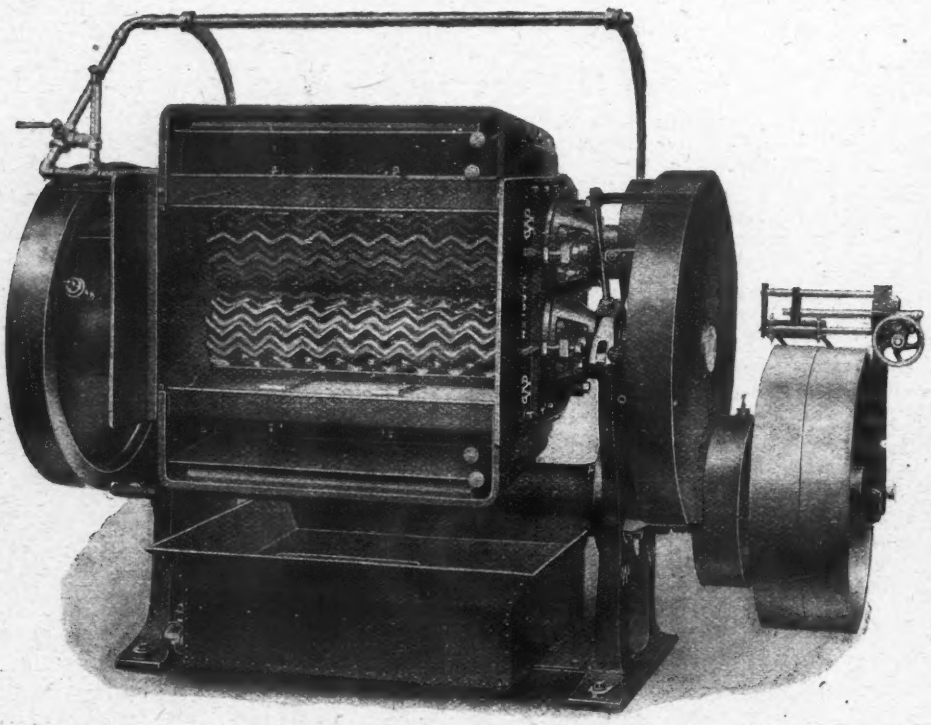


Fig. 1.—New Rubber Washing Machine, Tilted over to show the Interior.

The used washing-water flows from the jacket over sieves, which are held in frames that fit over a large receptacle placed immediately beneath the body of the machine. This receptacle acts as a straining device, and allows only the water to pass out at the bottom.

The method of working is:—Start the machine running and turn on the water, which should vary in temperature according to the material to be washed; then, as rapidly as desired, the entire charge may be thrown into the trough. The corrugated rolls will immediately take hold of the contents, carrying them down, round, and up again continuously and automatically. In doing this every point is opened to the flow of water, which carries sand and bark into the jacket and out of this into a straining vessel.

The temperature of the water should be so adjusted that the contents hold as much as possible to the rolls. If the temperature is thus properly looked after, sand, bark and new wood are rapidly removed by the washing water, and practically no rubber, gutta-percha, or balata (whichever is being washed) is carried away.

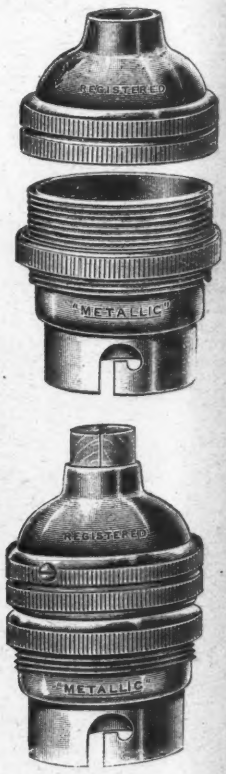
In washing rubbers, &c., containing large quantities of sand only, it is found most advantageous to keep the water level down; but in washing rubbers, &c., containing quantities of bark and new wood, the level should be raised as soon as the rolls have properly gripped the contents, when these impurities will readily float off and can be carried away through the outlets in the jacket.

The trough is made to tilt right over, as illustrated, to facilitate the removal of the charge. It is claimed that the simple method of feeding and discharging the machine, and the fact that no handling of the contents is required during the washing, make by it far the *safest* machine of its kind.

Amongst other advantages claimed for this machine are:—Automatic washing, which results in saving in labour, as several machines can be looked after by one man when low-grade rubbers, gutta-percha or balata are to be washed; saving of space; preservation of the life and nerve of the rubber, gutta-percha or balata, as the rolls are placed apart and thus do not have first to compress the contents into a sheet in order to remove the impurities Also washing is effected in a much shorter time than has been hitherto possible, which produces a result of finer quality; saving in horse-power, greater output, more thorough washing, and great durability, as all strains are very considerably reduced. Gravity is used to separate impurities, the lighter ones floating off and the heavier going through outlets in the bottom of the trough; and lastly, the foreign bodies are removed without pulverising them.

"Facile-Automat" Lampholder.

The "Automat" lampholder was recently described in these columns; The Metallic Seamless Tube Co., Ltd., of Wiggin Street, Birmingham, have also perfected and protected a new lampholder case, in which the loose ring, which is now generally employed to hold the dome and body of the case together, is done away with, the new method being to make the ring and the dome in one piece (figs. 2 and 3). This reduces the number of parts,



Figs. 2 and 3.—"Facile-Automat" Lampholder.

and makes the coupling-up of the holder much simpler than hitherto. This method of construction has also enabled the firm to improve on the manner of securing the cord grip, which is now part of the holder proper (figs. 4 and 5). The action of securing the dome and body of the holder together also tightens the cord grip, instead of the latter requiring a separate operation.

Figs. 4 and 5.—Cord Grip and Dome.

For cord-grip lampholders this pattern of case, having the "Automat" interior, possesses great advantages. The ease and rapidity of wiring the interior, and the time saved in fitting together the new case and self-acting cord grip, in addition to a reduction in the number of loose parts, make this holder unique. Particulars are given in a recently issued leaflet.

Universal Electric Light Fitting.

In the accompanying views and diagram we illustrate an apparatus suitable for a central fitting for art classrooms, or other situations in which the light must be placed directly over or in any position desired around the object of study. This apparatus may

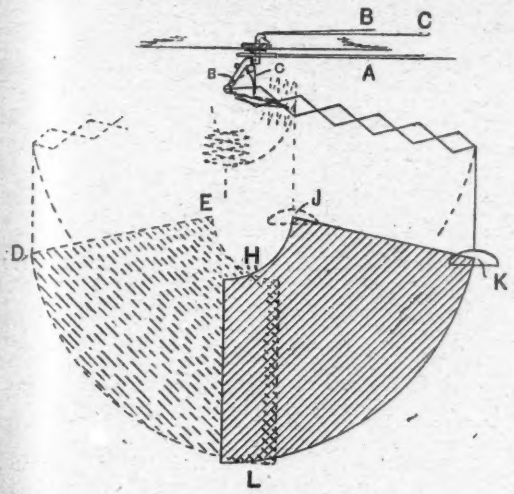


Fig. 6.—Range of Universal Fitting.

be suspended from the ceiling of a room of great height and entirely actuated from a remote position by a person standing on the floor-level of the room.

On the roof or ceiling a hollow trunnion is fixed (fig. 6); a bracket is suspended from the trunnion, and is revolved thereon by a pulley mounted on the bracket, and actuated by a rope A, which turns the

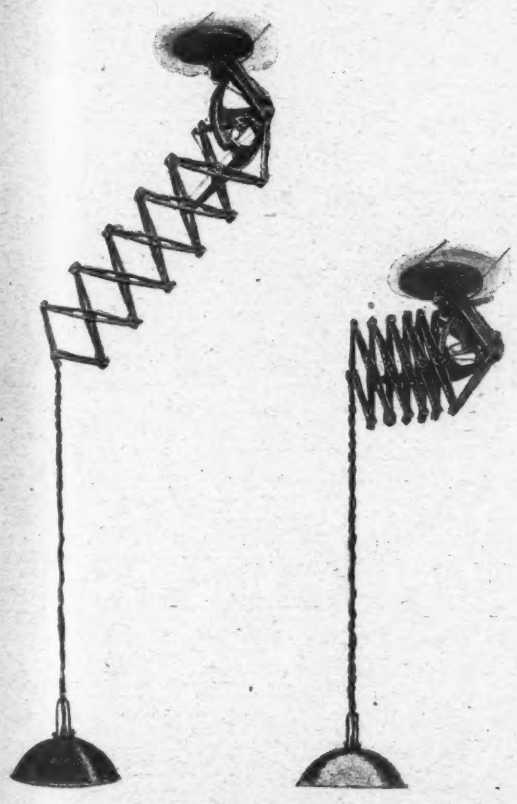


Fig. 7.—Two Positions of the Jib.

entire apparatus horizontally through a complete revolution or any part thereof.

Centred on the lower end of the bracket are the two inner half-links of the jib, and also a quadrant having fixed to it a guidepiece which supports a movable roller, arranged on the central pin of the first or inner pair of crossbars of the jib; these, as will be seen, connect by pins or pivots with the remainder or outer portion of the jib—formed of similar crossbars and thus collapsible—and with the above-mentioned two inner half-links centred on the lower end of the bracket. The jib, of course, is the familiar "lazy-tongs."

The galvanised-steel wire ropes B and C are led through the hollow trunnion and over pulleys in the roof in any desired direction. The rope B is carried around two guide pulleys on the bracket, and is connected to the centre pin of the second pair of crossbars; it is used to contract the jib, which extends by gravity as the rope is released.

By pulling or paying out the rope C, fixed to the quadrant, the guide-piece, roller, and consequently the whole jib and the light are raised or lowered accordingly.

Two small winches operate respectively ropes B to contract jib, and C to raise or lower jib, whilst rope A to revolve jib is operated directly by hand; these are situated together on the wall of the room.

The wiring being led along the bars of the jib remains of constant length, whether the jib be extended or contracted. Treble-wiring is fitted, suitable for 18 to 24 lights, arranged in three circuits of 6 to 8 lights each; it is taken through the hollow pins in the ends of the crossbars. The jib is constructed of aluminium to reduce its weight.

The illustrations show an apparatus capable of describing circles in horizontal planes varying from nothing to 14 ft. 6 in. in diameter, also capable of raising or lowering the light in vertical planes as shown in the diagram by the shaded area D, E, H, J, K, L. The maximum variation in height from J to L is 8 ft., and from H to L is 6 ft.

The apparatus illustrated is suitable for suspending 20 lb. on the 14 ft. 6 in. circle. It was invented and patented by Mr. George Thomson, Randolph Place, Edinburgh.

Magazine Fuses.

A new type of magazine fuse has been devised by Mr. E. Chaudoir, of 48, City Road, E.C. The mechanism of this is shown in the accompanying figures. There is a hopper or magazine above, into which half-a-dozen cartridge fuses can be charged; these gravitate as they are used into the groove seen in the wooden carrier, which is actuated by means of the rod and handle shown. The carrier is of the loose-handle type, a quick break

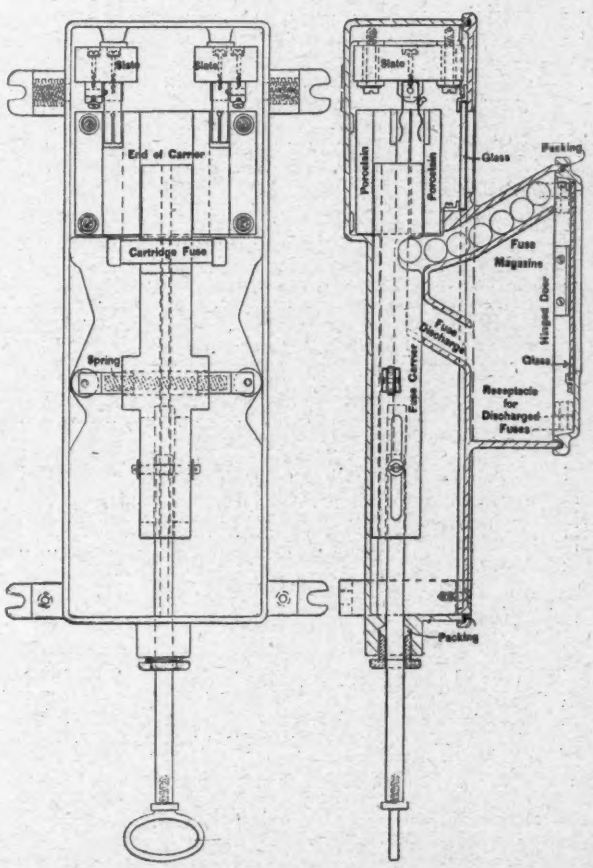


Fig. 8.—Chaudoir Magazine Fuse and Switch.

being obtained by means of the springs and cams provided. The apparatus can be used as a switch when desired, the fuse being withdrawn only to the middle position, and replaced; on pulling down the handle to the lowest position, the spent fuse is discharged into the receptacle provided, and the upward motion of the handle inserts a new fuse.

The device is very strongly made, so as to be suitable for colliery and workshop use—the one shown will carry 25 amps. at 500 volts. A smaller pattern is also being got out for house services, &c.

Rubber Works Burned.—According to reports in the daily Press, the North-Western Rubber Co.'s works at Litherland were destroyed by fire on the morning of February 27th. The damage amounts to £60,000.

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

CANADA.

In Canada preferential treatment is accorded to goods manufactured in Great Britain, and the rates of duty given below are for such goods. In order to obtain this preferential treatment, imports must be accompanied by certificates of origin. These certificates should be written, printed or stamped on the front or back of the invoice of the articles to which they relate, and should be drawn up in Form A, if signed by an individual exporter, and in Form B if signed by the representative of a firm. In the case of postal packages not exceeding $£5$ in value, the full form of the certificate is dispensed with, provided the contents of the package are not merchandise for sale, but a statement in Form C must be endorsed on the package. In addition to the certificate of origin required in the prescribed Form A or B in order that British goods may receive the benefits of the preferential tariff, a declaration as to the accuracy of the invoice must be supplied, and also a statement that the chief value of the goods was not produced in Germany. A form of combined certificate, which may be used on invoices of goods for entry under the British preferential tariff, is given under D. Goods for entry under the preferential tariff should be invoiced and packed separately from other goods. The packages, however, may be enclosed with other goods, provided the "enclosure" be noted on the invoice for other goods as well as on the preferential invoice.

"A."

Form of Certificate prescribed to be written, printed or stamped on the face or back of invoices of all articles, *except raw and refined sugars*, for entry under the British Preferential Tariff of Canada, *when made and signed by an individual exporter personally.*

(1) Full name of Exporter.
(2) Name of party or parties to whom articles invoiced.
(3) Insert in words at length total value of invoice.
(4) Names of the countries where the articles have been produced or manufactured, being countries entitled in Canada to the benefits of the British Preferential Tariff.

I, (1) ..... the exporter of the articles included in this invoice, have the means of knowing, and do hereby certify that said invoice being from myself to (2) ..... and amounting to (3) ..... is true and correct; that all the articles included in the said invoice are *bona fide* the produce or manufacture of one or more of the following countries, viz.:—(4) ..... and that a substantial portion of the labour of one or more of such countries has entered into the production of every manufactured article included in said invoice to the extent in each article of not less than one-fourth of the value of every such article in its present condition ready for export to Canada.

Signed .....

Dated at ..... this .....

..... 190 ....

Note.—Exporters are carefully to observe the above instructions on the margin when making their Certificates on Invoices.

"B."

Form of Certificate prescribed to be written, printed or stamped on invoices of all articles *except raw and refined sugars*, for entry under the British Preferential Tariff of Canada, *when made and signed by a person other than an individual exporter.*

(1) Name of person signing the certificate.
(2) Insert the words partner, manager, chief clerk or principal official, giving rank as the case may be.
(3) Name and address of exporter or exporters.
(4) Name of exporter or exporters.
(5) Name of party or parties to whom articles invoiced.
(6) Insert in words at length the total value of the invoice.
(7) Names of the countries where the articles have been produced or manufactured, being countries entitled in Canada to the benefits of the British Preferential Tariff.

I, (1) ..... hereby certify that I am (2) ..... of (3) ..... the exporter(s) of the articles included in this invoice, and that I am duly authorised to make and sign this certificate on behalf of the said exporter(s).....

I have the means of knowing, and I do hereby certify that this invoice from the said (4) ..... to (5)..... amounting to (6) ..... is true and correct; that all the articles included in the said invoice are *bond fide* the produce or manufacture of one or more of the following countries, viz.:—(7) ..... and that a substantial portion of the labour of one or more of such countries has entered into the production of every manufactured article included in the said invoice to the extent in each article of not less than one-fourth of the value of every such article in its present condition ready for export to Canada.

Signed .....

Dated at ..... this .....

..... 190..

Note.—Exporters are carefully to observe the above instructions on the margin when making their certificates on invoices.

(To be continued.)

NEW PATENTS APPLIED FOR, 1909.

Compiled expressly for this journal by W. P. Thompson & Co., Electrical Patent Agents, 322, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

3,637. "Means for directly converting an ordinary electric lampholder into a switch lampholder, being called a switch-adaptor." E. B. Wright. February 15th. (Complete.)

3,657. "Electric appliance for the relief and cure of bodily ailments." A. Atkinson and R. Hampshire. February 15th.

3,666. "Series adaptors and fittings for electric lamps and all other current-consuming apparatus." C. W. Richardson. February 15th.

3,669. "Preventing the slipping of the driving wheels of electrically-propelled vehicles or causing all the carrying wheels of same to revolve by direct action of electric motor." J. J. O'Flanagan. February 15th.

3,674. "Improvements in locking devices for holders for electric glow-lamps and other objects." G. Bowden. February 15th.

3,709. "Improvements in electrical heating devices." G. Kolemine and J. Juan. (Date applied for under Sec. 91 of the Act, March 19th, 1908, being date of application in Germany.) February 15th. (Complete.)

3,717. "Improvements in telephones." C. A. Randall. February 15th.

3,718. "Improvements relating to telautographic and like instruments." G. de Roussy de Sales and F. E. Grimaud. February 15th. (Complete.)

3,746. "Improvements in or relating to electric mine lamps." P. L. Trin. (Date applied for under Sec. 91 of the Act, December 19th, 1908, being date of application in Belgium.) February 15th. (Complete.)

3,759. "Device for lubricating the interrupter cams of magneto ignition apparatus." Firm of Robert Bosch. (Date applied for under Sec. 91 of the Act, October 31st, 1908, being date of application in Germany.) February 15th. (Complete.)

3,798. "Improvements in means for use in the manufacture of telegraph and like insulators." G. W. Carr. February 16th.

3,812. "Improvements in electric resistances." G. Hanchett, C. H. Barratt, and W. F. Jones. February 16th.

3,814. "Electrical torsiometer." A. Denny and C. H. Johnson. February 16th.

3,831. "Improvements in armature windings for dynamo-electric machines." N. W. Storer. (Date applied for under Sec. 91 of the Act, March 2nd, 1908, being date of application in United States.) February 16th. (Complete.)

3,836. "Improvements in portable electric light fixtures." L. A. Williamson. February 16th. (Complete.)

3,851. "Improvements relating to electric clocks and like instruments." H. Creese. February 16th.

3,854. "Improvements in electric winding devices, more particularly for use with time switches, meters and the like." H. F. Reason and Reason Manufacturing Co., Ltd. February 16th.

3,864. "Antiseptic telephone mouthpiece." E. Johnson and H. Johnson. February 17th.

3,897. "Improvements in electric incandescent lamps." E. Böhm. February 17th.

3,906. "Improvements in or relating to apparatus for use in systems of train lighting by electricity." Siemens Bros. Dynamo Works Co., Ltd., F. G. Broadbent and S. Hawkins. February 17th. (Complete.)

3,913. "Electrostatic toy." W. H. Chapman and W. Rollison. February 17th.

3,933. "Improvements in alarm devices for telegraphic and the like apparatus with the use of pulsating currents." W. Roubanowitsch. February 17th.

3,951. "Improvements in and relating to the manufacture of incandescent electric lamp filaments and apparatus therefor." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) February 17th. (Complete.)

3,953. "Improvements in and connected with the suspension of electric and other lamps and other articles." A. Wunderlich and G. A. Hughes. February 17th.

3,952. "Improvements in and relating to electrical apparatus for the production of singing pictures." A. W. Sharman. February 17th.

3,973. "Electrical current converter." C. Hanne. February 18th.

4,022. "New or improved electro-magnetic apparatus suitable for operating mechanism from a distance." T. Materikin. February 18th. (Complete.)

4,026. "Improvements in apparatus for wireless telephony." J. Schiessler. (Date applied for under Rule 13, March 30th, 1908. An invention comprised in Application No. 7,028, dated March 30th, 1908.) February 18th. (Complete.)

4,027. "Improvements in wireless telephony." J. Schiessler. (Date applied for under Rule 13th, March 30th, 1908. An invention comprised in Application No. 7,028, dated March 30th, 1908.) February 18th. (Complete.)

4,027. "Improvements in electric condensers." J. Schiessler. (Date applied for under Rule 13, March 30th, 1908. An invention comprised in Application No. 7,028, dated March 30th, 1908.) February 18th. (Complete.)

4,029. "Improved starting device for dynamo-electric machines." Rhodes Motors, Ltd., and S. H. Fielden. February 18th.

4,030. "Contact breaker for magneto-electric sparking apparatus for internal combustion engines." Unterberg und Helmle. (Date applied for under Sec. 91 of the Act, August 8th, 1908, being date of application in Germany.) February 18th. (Complete.)

4,034. "Improvements in and relating to electric batteries." H. de Martis. February 18th. (Complete.)

4,035. "Improvements in and relating to cable or telegraph code." M. L. Sweeny and C. H. Treat. February 18th. (Complete.)

4,038. "Improvements in magneto ignition apparatus." M. A. Codd. February 18th.

4,046. "Improvements in electric thermostatic cut-outs." H. F. Reason and Reason Manufacturing Co., Ltd. February 18th.

4,056. "Improvements in paper holders, particularly for use in telephones, but applicable also for other purposes." F. H. Clegg. February 19th.

4,057. "Improvements in or relating to electrical pyrometers." W. S. Peake. February 19th.

4,093. "Improvements in switches and automatic circuit breakers, especially applicable to motor starters." P. S. Brook and J. A. Hirst. February 19th.

4,111. "Improvements in means for actuating the contact arms or levers of electric switches." A. H. Curtis, A. H. Mackley and Adams Manufacturing Co., Ltd. February 19th.

4,117. "Improvements in the methods of electrically lighting motor-cars and other mechanically propelled vehicles." J. Polkey. February 19th.

4,122. "Improvements relating to alternating current arc lamps." M. Körting. February 19th. (Complete.)

4,125. "Improvements in receivers for wireless telegraphy." G. Marconi and Marconi's Wireless Telegraph Co., Ltd. February 19th.

4,133. "Improved electro-magnetic vibrator for local application to the person." A. Rosenberg. February 19th.

4,136. "Improved method of supplying tramcars with power from electric cables." R. Glover. February 19th.

4,162. "Improvements in or relating to telephony." S. G. Brown. February 19th.

4,164. "Improvements in and relating to the manufacture of filaments or coherent conductors of refractory material suitable for incandescent lamps and the like." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) February 19th. (Complete.)

4,172 "Improvements in insulated wire cables." British Insulated and Helsby Cables, Ltd., W. Aitken and C. R. Sproule. February 20th.

4,173. "Improvements in telephone apparatus." W. Aitken. February 20th.

4,175. "Improvements in or relating to electrodes for electric furnaces." M. Ruthenburg. February 20th.

4,181. "Improved method of and apparatus for controlling the voltage of dynamo-electric machinery, especially applicable to variable speed generators." W. Stanfield and J. J. Hatt. February 20th.

4,186. "Electric door lock." A. B. Colquhoun and S. G. Martin. February 20th.

4,199. "Improvements in and appertaining to the igniting of gas jets by means of electricity." W. R. Boyle. February 20th.

4,250. "Improvements in and relating to electric switches." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) February 20th. (Complete.)

4,282. "Improvements relating to Röntgen-ray apparatus." Siemens Bros. and Co., Ltd. (Siemens & Halske Akt.-Ges., Germany.) February 20th. (Complete.)